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NATURAL GAS LEGISLATION

HEARINGS

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

FIRST SESSION

ON

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MARCH 28, 1983, TULSA, OKLA.
MARCH 29, 1983, OKLAHOMA CITY, OKLA.

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NATURAL GAS LEGISLATION

MONDAY, MARCH 28, 1983

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Tulsa, Okla.

The committee met, pursuant to notice, at 10 a.m., in the State Office Building Auditorium, Tulsa, Okla., Hon. Don Nickles, presiding.

Present: Senator Nickles.

Also present: Howard Useem, professional staff member; and Elizabeth Moler, counsel for the minority.

OPENING STATEMENT OF HON. DON NICKLES, A U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator NICKLES. Good morning.

This morning we are going to continue hearings on the subject of natural gas decontrol and the administration's proposal, Senate bill 615, on the decontrol of natural gas.

As you probably know, we have now had 5 days of hearings on natural gas decontrol before the Senate. We expect to have 1 more day of hearings with the Secretary of Energy this month, and then it's the expectations of the committee to begin markup. We have scheduled several days of markup on decontrol legislation this year. Hopefully, we will be able to report it out of the Senate before the summer.

Throughout the last several decades there's often been a serious misunderstanding about how we can best utilize our energy resources. This confusion has often resulted in misguided Government policies aimed at regulating those resources.

The history of natural gas regulation is a perfect example of how Government interference first distorts and then disrupts the process of fair, equitable, and productive utilization of our resources.

It is in this light, though, that I look forward to working with every concerned group to develop a new national policy to correct the mistakes of the past. The Reagan administration's proposal to deregulate natural gas is a very good starting point.

My views on this subject certainly reflect my own convictions about the importance of free enterprise. There is no better regulator of our energy resources than the marketplace. Government may think itself smarter than the free market, but history has proven otherwise.

During the debate over the decontrol of oil, supporters of big Government lashed out against the Reagan administration for giving the free market a chance. The prophets of gloom and doom were wrong. Gasoline prices did not increase; rather, they began a steady decline. Based on their past performance, opponents of the free market should not be too quick to condemn natural gas deregulation.

The problems in the natural gas industry during the last two decades were a result of Government intervention and regulation. It was Government regulation that caused the massive curtailments and shortages of natural gas in the mid-1970's.

How did Washington respond to the situation? With more Government.

Congress created the Natural Gas Policy Act, which may have eased the earlier shortages, but has compounded the regulatory confusion and market dislocations.

Here in Oklahoma we have gas that we can't sell. Why? Because the Federal Government has been gumming up the basic laws of supply and demand.

In 1981 and again last year, Oklahoma produced a record amount of natural gas. For the last couple of years we have been producing right at 2 trillion cubic feet of gas. Yet, despite this high rate of production, natural gas prices for the consumer continued to escalate, primarily because of the counterproductive nature of the current law.

Part of the administration's bill which I wholeheartedly support, is the repeal of the Fuel Use Act. I introduced legislation in the last session and also this session of Congress to repeal this act. This law has caused considerable concern in Oklahoma.

Had Congress not amended the act in 1981, it would have cost Oklahoma consumers millions of dollars in higher utility bills. Unless the entire act is repealed, it will continue to be an economic burden on both consumers and industry. Again, it is another example of how Government regulation has been a poor manager of our resources.

I do have a few reservations about the administration's proposal. First, in my opinion, the legislation does not go far enough, fast enough. The longer we maintain complicated regulations on natural gas, the harder it will be on the economy, the consumer, and on the producer. The no-flow-through provision keeps controls on gas until January 1, 1986. I believe that everyone would benefit by more rapid deregulation of all gas.

Second, I am concerned about the way in which private contracts are treated. Congress must tread softly on the issue of tampering with privately-negotiated contracts.

The root cause of today's natural gas problems is not current contracts; rather, it is Government over-regulation.

If we assume that private contracts are the problem, I fear that Congress will be timid in seeking a long-lasting solution based on deregulation, and, instead, merely force the rewriting of every contract not to Congress' liking. This is a very dangerous step.

Third, the proposed method of calculation of a cap on natural gas may cause a severe "distortation" of market prices. Many believe the gas cap price would be below the market price of gas, and could force a producer to sell his gas for substantially less than for what it was stated in his present contract, which, incidentally, he negotiated in good faith and in compliance with the NGPA.

Many independents are highly leveraged. And any forced roll-back in price could force them into bankruptcy. And the current status of the oil and gas industry in Oklahoma, as most people are aware in this room, is in pretty serious shape. Today in Oklahoma we have 288 active rigs. That compares to a year ago of about 855. We've experienced a tremendous decrease in a period of only 12 months in the number of active rigs that are running in the State of Oklahoma.

Nationwide, we find that as of March 15 we are running about 2,269 rigs as compared to 4,154 a year ago.

So, again, I think it shows that the present status of the oil and gas industry is in a difficult time. And so any moves or measures that are taken by Congress must be taken with a lot of forethought and really done in a manner that will not create, I think, further economic burden on the exploration interests of our country.

A further concern about the Reagan administration's proposal, is that it doesn't address the problems caused by high priced imported natural gas, primarily Canadian, Mexican, and LNG imports.

I am sure that many of the witnesses testifying today may share some of these concerns. I look forward to hearing your statements and comments about natural gas deregulation. I think it will be very beneficial, not only to myself, but to other members of the committee, many of whom wish to be here. As you know, we're in the process of an Easter week break, and for the most part, Senators are in their own States talking to their own citizens.

All things considered, I do believe that total deregulation will be of great economic benefit to this Nation, and certainly to the State of Oklahoma.

I hope Congress will be able to quickly move this legislation designed to allow the marketplace to work, and I believe it will work, in a fair and productive way for all.

We have several witnesses that are with us today. Many have expertise that we don't have in Washington, D.C. That's part of the purpose of having field hearings, to bring in some real experts and people that are directly affected in a very critical way on important legislation. And in looking at the persons who will be giving their statements and comments and answering questions, we are very fortunate to have several people today that I think will be of very strong benefit to myself and other members of the Senate Energy Committee.

For our first guest today we have Tom Cantrell, who is a Deputy Assistant Secretary in the Department of Energy. And Mr. Cantrell is no stronger to Oklahoma nor to Tulsa. We are pleased that he is in the high position that he is in the Energy Department. We look forward to his comments and possibly a brief explanation of the President's decontrol plan, Senate bill 615.

And, Mr. Cantrell, we appreciate your appearing before this committee.

STATEMENT OF P. THOMAS CANTRELL, DEPUTY ASSISTANT SECRETARY FOR SENATE LIAISON, DEPARTMENT OF ENERGY

Mr. Cantrell. Good morning. Thank you, Senator.

I want to underline your comments about the importance of having field hearings and bringing them out here. You are to be especially congratulated for insisting upon the Senate Energy and Natural Resources Committee to have these field hearings, to get us outside the Potomac on occasions, to get out and listen and hear a little more. You are to be congratulated for that.

It's an honor to be a part of this today, and again tomorrow in Oklahoma City; to represent the administration's proposal. But, most importantly, it is to hear what your other witnesses will have to say, both here and tomorrow, on the administration's proposal.

As you know, our proposal is just that: A proposal. It's one that we believe best addresses the entire problem that the Nation faces today in the natural gas issue. But it's one in which we are more than willing to discuss as it moves through the legislative process. And, hopefully, we will, in fact, bring out a bill which will begin to solve the problems that the American consumer, American producers, are finding themselves in today.

The administration's proposed legislation on natural gas is entitled "the National Gas Consumer Regulatory Reform Act of 1983".

It is designated in the Senate as S. 615 and in the House of Representatives as H.R. 1760.

It is a comprehensive attempt to bring the natural gas question out of the dark ages of Government regulation into a market system through a rational transition period.

The purpose of the administration's proposal is to assure that adequate supplies of natural gas are available at reasonable prices.

A little bit of the background: Federal regulation of natural gas in the interstate market dates back, as most of you all know, to the 1930's. Between 1938 and the late 1970's the various intrastate markets were unregulated.

This two-tiered system operated without apparent difficulty until the economic expansion of the late 1960's, when demand for natural gas increased sharply, federally controlled interstate prices were maintained at below market levels; intrastate prices were not so constrained. When combined with the oil embargo of 1973 and 1974, it caused the interstate-intrastate price differential to increase dramatically.

By 1976, through 1977, the federally controlled price of interstate gas was approximately 70 cents per Mcf, compared to the free market intrastate gas price of $1.20 per Mcf.

With such a price difference there was little incentive to produce gas for interstate markets. Shortages predictably appeared, and interstate pipeline companies did not have sufficient supplies to meet consumers' demands. In the severe winter of 1976 and 1977, interstate shortages reached crisis levels. Consequently, it appeared that domestic supplies were nearly exhausted. The fact was that Federal regulations had created an artificial impression of scarcity, by keeping the interstate prices below free market levels, thereby encouraging demand and discouraging production at the same time.

No such problems existed in the unregulated intrastate markets.

In response to these shortages, the problems of two markets, Congress passed the Natural Gas Policy Act of 1978, (NGPA) to create a single market for natural gas. The NGPA regulates intrastate wellhead prices for the first time, and encourages new production by providing a range of incentives.

The act established a new regime of price controls on virtually all gas supplies. Only gas from very deep wells was decontrolled. The objective was to stimulate new production on the one hand, while providing lower prices to the consumer on the other.

Five years experience proves that NGPA is not working. Prices are rising rapidly, despite lower demand and plentiful supply. Pipelines and producers are locked into contracts that require payments for specific amounts of gas, regardless of whether that gas can be sold to pipeline customers.

The gas that is expensive to produce is being brought to the market, while lower cost supplies are being shut in.

I was struck to hear a colleague of yours, during Secretary Hodel's comments on March 9 of this year before your committee, characterized this situation by saying, "The market just hasn't worked." Implying that more Government control is needed to rectify the situation. And nothing could be further from the truth.

We have had neither a market nor do we need further Government regulation to save us. What is needed is a rational approach from a regulated market to a disciplined market system.

As the administration's proposal was developed it was clear that any effort to address the natural gas issue must be based on three specific principles, and they are reflected in the administration's proposal: One: Freedom for producers, suppliers, distributors, to negotiate new contracts which would be allowed to operate on their own terms, free of Government coercion, Government scare tactics, and Government regulation.

Two: Eliminate disincentives to produce and sell low-cost gas.

And, three: Guarantee a high degree of consumer protection.

The administration's proposal contains two important provisions to protect consumers against any unreasonable price increases. Pipeline companies will be prohibited from immediately passing through to consumers any increases in cost of purchased gas, other than those attributable to inflation.

A gas price cap will be established on the basis of the volume weighted average price of gas purchased through contracts newly executed or renegotiated after enactment of the legislation. Prices under existing contracts that are not renegotiated will be limited to the present NGPA price ceiling or the gas price cap, whichever is lower. This provision will insure the customer's benefit from the current environment of declining energy prices. The cap applies until 1986.

I am quick to add that it is not the opinion of the administration in all of our econometric studies that the gas cap price or NGPA price would, be necessary; but, in fact, it is a standby safeguard insurance policy, in case something unforeseen should occur, the consumer is still protected.

The administration feels very strongly that, under a free market, the consumer prices under the present day situation will not go up.

In today's market, pipeline companies are bound by onerous contract terms that tie prices to inflexible regulatory ceilings that keep rising, and by provisions that require payment for specified amounts of gas, regardless of whether that gas can be sold to customers.

The administration's proposal permits contracts to be negotiated or renegotiated, on whatever terms the parties agree to; and, thus, become free from any further Federal Government regulations. This will allow producers, pipelines, distributors, and consumers to respond to the current market conditions which include the current downward price pressures. If there has been no renegotiation of a preenactment contract by January 1, 1985, either party may—I say again—may abrogate such a contract. It is not mandated automatically; it is up to the parties to decide.

This market-out provision will act as an incentive for earlier renegotiations.

Our proposal will eliminate these disincentives to low-cost gas by allowing take-or-pay requirements to be reduced at the option of the pipeline to 70 percent of the required amount under contract; thus giving pipelines, then, freedom to buy and search out and purchase lower cost gas. Allowing producers to sell to any willing buyer the amount of gas removed from take-or-pay provisions, and requiring that such gas be transported by the refusing pipeline at an incentive rate will further generate incentives for pipelines to move and purchase low-cost gas.

Our proposal will remove the Fuel Use Act and incremental pricing restrictions that encourage industrial users to switch to other fuels and thus leave residential customers to bear the large share of fixed price of the gas supply system, and it will eliminate controls on the price of old gas which cause supplies to be shut in, and, therefore, lost to the market thus denying consumers the benefit of these low-cost gas reserves.

Comparing the effects of the administration's proposal to current law, the administration's proposal will result in an estimated reduction of at least $7 billion present discount value in consumer costs through 1990.

Under current market conditions and using very conservative assumptions about oil prices, we estimate that our proposal will reflect in the first year an average price decrease of between 10 cents per Mcf and 30 cents per Mcf on natural gas.

In addition, our proposal will result in prices that are 20 cents per Mcf to 40 cents per Mcf lower than prices that would occur under the current NGPA if continued.

Inflation, to a small degree, will be favorably impacted, both directly, that is, to the homeowners, as well as indirectly to the economy through reduced costs of goods that are produced utilizing natural gas. For example, bread.

Increased supplies of lower cost gas resulting from the administration's proposal will cause gas to compete more effectively with oil. And we estimate that oil imports will fall below current projections by 100,000 to 200,000 barrels per day. The administration's proposal will encourage production of lower cost supplies before higher cost supplies are produced, resulting in more efficient allocation of this Nation's resource, natural gas.

One thing should be made clear. We are talking about unit prices declining and not necessarily total gas bills. We had a mild winter this year; and should next year be significantly more severe, a homeowner's bill is likely to go up—less under our proposal than otherwise would be the case—but higher nonetheless.

The importance is, under the administration's proposal, those increases will be smaller than if left under current NGPA prices. Passage of the administration's bill will not be easy. The administration stands ready to work with you, Sen. Nickles, the rest of Congress, for its passage.

We are not coming to you, the committee, the Congress or the American people with a "take it or leave it" proposal or attitude. Rather, that's why I am here today. I am sure that's why you are here today, to hear the testimony from these witnesses in the spirit of good-faith efforts to solve this tremendous national dilemma.

I am happy to answer any questions, Sen. Nickles, you may have. I again congratulate you and look forward to hearing the testimony of the other witnesses.

Thank you.

Senator NICKLES. Thank you very much, Mr. Cantrell.

Do you see any parallel between the administrations efforts to decontrol natural gas now and their efforts, successful efforts, I might add, to decontrol oil in January of 1981?

Mr. CANTRELL. I believe there's a very direct correlation.

As you know, there is much the same rhetoric that we hear today when we make a proposal to deregulate gas that was heard when the President did, in fact, deregulate oil; that, in fact, the price of gasoline would go to $2 a gallon overnight. That's of course, was not the case. The market was able to take hold. The market was able to work. The American people have been able to conserve, to change their life styles, their purchasing habits, and adjust to that price of oil. We are now seeing the benefits of that sacrifice coming back into our economy. And we are convinced that the same thing will happen if we allow the market to work with natural gas.

Senator NICKLES. The critics of decontrol of oil, if I remember—and that was when I was just going to the Senate—but it was very loud and prolonged that it would have a disastrous effect on consumers; and that in the name of consumer protection, they were going to oppose any effort to decontrol oil.

We now hear almost the same verbiage, this with natural gas inserted instead of oil.

The decontrol of oil, I think, has had a very advantageous impact on consumers. The parallels that you have mentioned, as far as regulation, we had the old oil and new oil, and now we look at old gas here.

The administration's proposal also calls for decontrol of old gas. Is that correct?

Mr. CANTRELL. That's correct. So-called section 104 gas.

Senator NICKLES. One hundred and four would be decontrolled by when?

Mr. CANTRELL. Well, under the proposal, it could be immediately decontrolled, if parties chose to renegotiate contracts; because those renegotiated contracts would be absent any Federal wellhead price controls or regulations.

If neither party decided to renegotiate by January 1, 1985 either party could market out of the contract and renegotiate new contracts.

If the contract that is in force today still makes sense to both parties on January 1, 1986, they may continue to go right ahead with that contract.

Senator NICKLES. So under the administration's proposal, any contract that is—any new contract that is signed would be decontrolled.

Mr. Cantrell. That's correct.

Senator Nickles. And any contract that is renegotiated, whether it be old or new, or whether it would be 104 or 102 or 103, 107, whatever, any renegotiated contract would be decontrolled.

Mr. Cantrell. That's correct.

Senator Nickles. It would be subject to its terms and conditions between the buyer and the seller.

Mr. Cantrell. That's correct. Absent Federal wellhead price controls.

Senator Nickles. That's any new or renegotiated contract. And those two added together would come up with what is commonly called the gas cap.

Mr. Cantrell. That's correct.

Senator Nickles. Now, may——

Mr. Cantrell. That would be a weighted volume average on a 3-month cycle.

Senator Nickles. The gas cap. I have been one that's been critical of the fact that we would have—under the administration's proposal, renegotiated contracts added or computed in that weighted average to compute the gas cap.

Mr. Cantrell. That's correct.

Senator Nickles. Do you have any idea, does the administration have any estimate, on where they think the gas cap level would come out per Mcf?

Mr. Cantrell. As I recall, and I could get the figure exactly, but, as I recall, the estimate was around 2.90 per Mcf.

Senator Nickles. If that was the case, and I find it hard to figure, but if that was the case, and you presently had a contract, say, for 102 or 103, it was in the neighborhood of 3.30, then you would be talking about a rollback.

Mr. Cantrell. Because it's a weighted volume average, that would depend on how much 102, 103; it would also depend on what the NGPA price would be. There would be a lot of variables to determine.

It is not possible to say exactly what the price would be, because of the impossibility of figuring what the market would negotiate for that particular price. If that is still under a nonrenegotiated contract and it's 102 section we do not know for sure what the national selling price average, weighted average, would be of 102 gas. So we can't say that it would be lower or higher.

We do know that it will be either the NGPA price or the gas cap price, if the gas cap was lower.

Senator Nickles. Well, realizing that, and realizing, too, that it may well be—if you are talking about renegotiation of old gas contracts and renegotiation of high-cost gas contracts, anything that would be renegotiated would be computed in the gas cap.

Mr. Cantrell. That's correct.

Senator Nickles. If you had a large number of old gas contracts, which we have quite a few in Oklahoma, in the western part of the State, if you had a large volume of those contracts that, say, were selling for 40 cents that were renegotiated up to say, $1, which certainly is still quite less than market clearing levels of natural gas, then wouldn't that have a tendency to pull the cap down, which would possibly assist in your goal of bringing down the price of gas; but, conversely, might bring the cap down to where you could impose a difficult burden on, say, a producer that had a contract. If he had a contract for $3.30 and the gas cap came in at $2.90, you just rolled back his price substantially; he may be on the verge of bankruptcy today?

Mr. Cantrell. There is no question that the administration's proposal in certain cases will cause some adjustment. It is a 2-year transition period that we are asking to go through, from what is now a totally—practically, for all practical purposes—almost totally regulated market, that has been that way since the thirties, and for all practical purposes 1954, to move to a market discipline which will allow the price to be determined by supply and demand, as well as its usage in the marketplace.

What we are asking for is a transition period to help adjust our moving from the Government regulation to the free market, in a time in which that trauma, that change, can be on behalf of the consumer, the producer, and the long-term interest of the entire economy, a transition and as smooth as possible.

To say that because we are going to move from the present market to a free market, the people who have, in fact, been involved in the present market will not have to make some adjustments, is not being honest with you or with the people here. There will have to be some adjustments made, by a lot of people.

Senator Nickles. I understand, Mr. Cantrell. But in renegotiating contracts, particularly old contracts and for the decontrolled or the 107 contracts, neither one of those, probably, actually reflect the marketplace; maybe a balance of the two do.

Mr. Cantrell. Correct.

Senator Nickles. One of the things that I would hope that the administration might consider would be in working out the definition of "gas cap" to include only new contracts, period; something that would be very closely targeted in to the actual market clearing level of natural gas. And so we would see that figure be more reflective of the real market.

I think in reading the statement that Secretary Hodel kept referring to the gas cap as being a market-level instrument, I would like to see it be a market-level instrument, too; and I have some concern that maybe the renegotiation of old and/or new, new being outside on the top side, and old being outside on the bottom side, maybe they would average out; maybe they wouldn't. I don't know that any of us know. But possibly consider some adjustment in the definition of contracts.

There are several producers that are here that will ask you about abrogating contracts effective January 1, 1985, giving a one party out; and there may be some pipelines that are here that may say we don't want to see contracts or one party having to market out provision. If it's pipelines, they have just been buying the old gas at a very cheap level for a long time, and it may have another 5 years on that contract; or, conversely, may be somebody who is selling deep gas.

How do you answer that criticism that Government shouldn't be tampering with privately-negotiated contracts that were negotiated in good faith and in compliance with NGPA?

Mr. Cantrell. Senator, let me first say your concern about how the price cap is fixed has not been lost on the administration. You have been very tenacious in pointing this out over and over again. I just reemphasize the fact that the administration considers this a proposal and a starting point for discussion in the legislative process.

As to how the gas cap is figured, we hope we will arrive at some give and take and some discussion where it is a rational, best-effort figure, as to what is the most closely related to the free market.

As far as the contract goes, there is no question in this administration—should be in every administration—a very strong concern when we move in and begin to say we are going to allow a new situation to exist in connection with the contracts.

I want to emphasize the fact that we are not saying the contracts are null and void. We are saying that at the option of the contracting parties they can be made null and void.

Senator NICKLES. There are some legislative proposals that would say that all contracts are null and void, I think.

Mr. CANTRELL. That is correct. And that is not the administration's proposal.

Within this administration this was not a very easy proposal to come up with. It was a very difficult decision. We do believe very strongly in the sanctity of the private contract. However, given the market situation that has been controlled for so long, the need to move to the market system, a process whereby we would give marketing parties an option to choose to renegotiate contracts without Government intervention—remember, these contracts were originally entered into not totally free of Government involvement.

The Government basically set a lot of the terms, as far as the price, on what would be paid in that particular contract. So these contracts as they are now are not absent Federal involvement. We did, in fact, search hard, the precedent is there; we are convinced that the Constitution and the Supreme Court do allow the Federal Government to say in these cases that we can, in fact, put a parameter around the contracts and say that you have an option to market out or renegotiate or stay the same.

It is not an easy thing. The Constitution does prohibit any State from becoming involved in any contract between private parties; but is silent on the Federal Government. And the legal precedence is such that, in fact, the Federal Government does contain that power and authority.

Once we came to that conclusion that we did have the power and authority, it was still a very difficult decision. But the fact is that, in order for us to move from an irrational Federal policy of controlling to a market discipline, we had to give some time frame in there by which contracts could be renegotiated under the coming market condition analysis, as opposed to keeping those in force that were, in fact, made in good faith, as you say, but under at that point Federal regulation, and under the assumption that there would be forever regulated contracts and a diminishing supply and an ever-increasing price, and a very small elasticity in the demand for gas.

We were misled by Government policy during those periods of time. Now we want to get a time for correction of that in today's evidence, and then hopefully move to a free market.

It's not an easy answer. It's a pragmatic answer to a very difficult question. And we feel that it's an integral, important part of the overall plan that we have proposed, in order to make it work, to move to that free market system.

Senator NICKLES. That one party out, whereas—would begin on January 1, 1985, would that expire on January 1, 1986?

Mr. CANTRELL. That's correct.

Senator NICKLES. All right. They would exist—if you had—if the parties did not voluntarily renegotiate their contract by January 1, 1985, then either party could market out after January 1, 1985; but only up until January 1, 1986.

Mr. CANTRELL. That's correct.

Senator NICKLES. The administration's bill did not touch on the problem as I brought before the Senate on a couple of occasions of imports. And what we see under the administration's bill, as I would categorize it, is an effort to decontrol all gas by January 1, 1986, but we have price controls on gas until January 1, 1986, either through the cap or either through the passthrough limitation.

Mr. CANTRELL. If the parties choose not to renegotiate.

Senator NICKLES. If the parties choose not to renegotiate. Then their gas is still under Federal price controls. Possibility even a rollback from what their current contracts are, which bothers me greatly. But, given that, that's domestic.

But we see no limitation on imports. And, as a matter of fact, we see gas that is shut in, in Oklahoma, in many cases cheap gas that's shut in, in Oklahoma, but, yet, we see that we are importing large quantities of Canadian or Mexican gas at $4.94. And, as you know, I have done a little homework, and we find that we are greatly subsidizing their governments by importing gas at that quantity.

Likewise, we see some large contracts that are coming in with Algerian LNG in the neighborhood of $7.13, I think, per Mcf, very high cost; but they are not under the administration's price limitations. So it doesn't—except for, I guess, the passthrough gas limitation, they would be included in the aggregate; but what I am concerned about is that they maybe end up crowding out or squeezing out a lot of domestic production.

It seems inequitable to me that we would have that as our policy, where we would end up possibly squeezing the domestic producers where we are producing less, cheaper domestic gas production, while we are continuing to bring in very high-cost imports?

Mr. CANTRELL. I think the point that you raise is a very valid one, and begins to, once again, underscore the irrationality that we are having to operate under the present-day law. All that you've just mentioned about cheaper gas in Oklahoma being shut in, and more expensive gas coming on line, is under the present NGPA circumstances based upon assumptions made back in the late seventies about what the future supply of gas was going to be, the availability of gas, and the price of gas was going to be.

In a time in which we now have a very large over-supply of gas in the market, if we are able to deregulate the price of that gas, in our opinion there will be no choice, no choice at all, for the imported gas coming in, if they wish to stay a part of our market, to compete with cheaper domestic prices of gas.

As you know, we are in the process now of some discussions with the Canadians. The Canadians have, in fact, expressed and acknowledged that it is their intent to export gas to the United States, and it's not lost upon them that they cannot continue to export gas into this country under the deregulation mode that we will have at the price that they are presently charging.

It is our belief that the pressure that will be brought on foreign countries who wish to stay exporters to the United States, will be forced through the market system to make their prices competitive. They will have to come down, because under our scenario we feel strongly that that natural gas from Oklahoma won't be shut in like it is right now, bcause, in fact, the 70 percent take or pay there will be a lot of pipelines and a lot of direct distributors who will be out trying to buy that gas here in Oklahoma, because of the passthrough limitation.

Senator NICKELS. As I have indicated to you privately, and also before this, I have a hard time agreeing to the abrogation of contracts. But, conversely, I really have a hard time seeing where we might abrogate domestic contracts and not abrogate foreign contracts, where you might end up having a situation where you continued to bring in the very high-cost gas through LNG or whatever; and yet be abrogating some contracts in Oklahoma.

One final question. The one party out, where the market out provision that is in the administration's bill, by January 1, 1985 either party could opt out of the contract.

This would also include opting out of high-cost gas, 107 gas; it would also include low-cost gas, some 104 gas. Isn't that correct?

Mr. CANTRELL. That's correct.

Senator NICKLES. So it works on both angles. It might help reduce prices in one area, and it might raise prices on another, and work towards bringing in a closer of the marketplace.

Mr. Cantrell, we appreciate your statement before this committee, and also your appearance; and also for the fact that I am sure that you will be dutifully listening to some of the other witnesses and keeping in mind some of their thoughts, concerns and problems with the legislation; and, hopefully, that will give us some worthy input, making some changes, and hopefully some improvements on the bill that we have before us.

Mr. CANTRELL. Senator, thank you. And, again, I congratulate you for the hearings. I appreciate the opportunity not only to explain the administration's proposal, but, as you say, to hear and listen to the witnesses the rest of the day as we go through this process.

Thank you.

Senator NICKLES. Thank you very much.

On our first panel today we have a panel of Oklahomans from Tulsa, Robert Boswell, president of Adams Energy Corp., in Tulsa; Kent Harrell, president of Harrell Energy Co.; and Whitney Marvin, president of Whitmare Exploration Co.

Please begin and after each of your statements we will ask a couple of questions.

STATEMENT OF ROBERT BOSWELL, PRESIDENT, ADAMS ENERGY CORP.

Mr. BOSWELL. Senator, my comments will be brief. I have to leave right after my testimony, as I have explained earlier.

It's a privilege to be here today. I was asked to comment on the administration's proposed national gas legislation which I have read in summary form, and have read various articles in various journal publications recently.

My understanding is that the first natural gas policy of the United States was developed in 1954 and is now embodied in the Natural Gas Policy Act of 1978.

The purpose of the proposed legislation is to deregulate the natural gas industry over time, and to help alleviate some of the existing deficiencies in the current legislation as it relates to such deregulation.

The principal problem I see in the proposed legislation is the saying that all regulatory policies are aimed at controlling prices. That is that it's created imbalances between supply and demand which suppress the natural forces of economics.

This situation is compounded by the fact that two of the primary purchasers of natural gas are quasi-public businesses which are regulated and granted certain oligolopolistic—they are oligopolies—in the nature of the services of the products that they provide to the public.

I am speaking here mainly about the pipelines and the utilities.

Having said these things, the specific parts of the administration's proposal which, I would endorse, are as follows:

One, I think that there is a need for a contract carriage and incentive rates. The pipelines need to fulfill more of a common carrier's role. And this would allow producers to have greater flexibility in negotiating with end users.

I think if this were allowed, it would eliminate somewhat the need for the moratorium on automatic transfers, and more competition for the purchase of natural gas would result between the ultimate end user and the producers.

This would also, I think, allow pipelines and utilities to somewhat shed the averaging mentality as they negotiate their contracts.

The second thing I would like to see is the repeal of the Fuel Use Act and the incremental pricing.

Natural gas is one of our country's cleanest burning and most easily transported fuels. I think its consumption should be encouraged. The legislation that was implemented on the Fuel Use Act was aimed at—was created at a time when natural gas was in more of a shortage situation. It was aimed at, I think, developing alternative sources of fuel.

The need is still there. However, I think that there are ample natural gas reserves in this country to be developed; and that pricing should dictate the economics and the demand for the various alternative fuels; and it does not make sense to legislate how fuels can be used.

I would oppose the following elements of the proposed legislation:

One is the gas cap. I think this opposition would go in tandem with an opposition to allow—I would oppose allowing contracts to be renegotiated.

The gas cap, I would oppose because I think it's just a further extention of price controls which are unnecessary and counterproductive. The primary concern is the—what will the new price be, if you eliminate controls.

I think the—those—that price is really a function of gas contracts. If you are a producer, most of your contracts are 10, 15, 20 years.

I know our company has contracts for gas at very low prices which it would sure be nice to get out of and have a new price.

On the other hand, those reserves were developed when we had different costs. And the economics are still intact there. It's just that the gas has a greater value now than it did at the time that those were negotiated.

Likewise, I think that on our new contracts, some of our new contracts the price we have may be higher than we would receive in today's market.

On the other hand, our costs were higher a year ago than they are today. The economics are generally still intact on those.

I think what you are going through is a cycle right now. And in those cycles there are disequilibriums, the point here being that the contracts that are in existence are generally long term, and they should, in effect, smooth out any price disequilibrium or changes that would be made as a result of deregulation.

Finally, I suppose that, conceptually, I would oppose the legislation simply because it represents an extension of control; offers greater complexity and deeper Federal intrusion into the natural gas industry.

I think what we need is a commonsense approach toward a gradual deregulation of the natural gas industry. You do that, I think, by examining the NGPA and putting on phased—phasing out the legislation, sunset type of approach, that over time that many of these regulations are phased out.

I think in the longer term it is imperative that the natural free market forces be allowed to work by gradually removing all wellhead price control.

I think if this were done, it would result in increased domestic energy supplies. It would encourage conservation; it would reduce wastes; it would minimize national security problems on related dependence on foreign imports, high cost; it would correct market disorders and regional price disorientations; and, finally, reduce the amount of costs associated with complying with Federal Government reporting requirements.

Senator NICKLES. Thank you very much, Mr. Boswell.

I understand you need to leave?

Mr. BOSWELL. Yes.

Senator NICKLES. Let me ask you just a couple of questions before, then, we go to the rest of the panel, because I know you do need to leave, and I appreciate your appearance before the committee.

So you, basically, said that you wanted total deregulation, but you don't think we should be abrogating contracts. You mentioned that you have some old gas contracts as well as some new gas contracts; and you really don't think that government should allow for one party to market-out. You don't have any problem if both parties decide to renegotiate the contract. But you don't want the government to unilaterally say that one party can get out beginning January 1, 1985.

Mr. BOSWELL. That's correct.

I think if you examined probably the mix of old gas contracts and new gas contracts, you would find that there would be a much larger percentage of old gas contracts than there are new. And those would probably move up the average price of gas.

Senator NICKLES. So you think maybe it might even be to your economic advantage if——

Mr. **Boswell**. Yes.

Senator **Nickles** [continuing]. To have the proposal where you could abrogate some of those old contracts and move those up closer to a market——

Mr. **Boswell**. Yes.

Senator **Nickles** [continuing]. Clearing level, but you have a philosophical edge against tearing up a contract that you signed in good faith with a pipeline.

Mr. **Boswell**. Yes. I don't think it makes sense. I don't think it makes economic sense for either party, in that the economics that dictated that this gas was explored for and developed 10 or 15 years ago were good at that time; and just as there are economics today that dictate the amount of exploration we will do this year; and as prices come down, or as the percentage changes, the amount of exploration changes; so the price really controls your activity levels. I think if you go back and try to change history, does not serve any useful purpose.

Senator **Nickles**. I also got from the latter part of your statement that you did hope that we would make some changes in NGPA and try and phase out controls as soon as possible on old gas, but keep contracts in place; and those contracts that were in place would have a stabilizing impact that would keep contracts from——

What was the average term of the contracts that you have, in years? Do you have any idea?

Mr. **Boswell**. Yes. I would say our average term is probably 15 years.

Senator **Nickles**. Fifteen years?

Mr. **Boswell**. Yes.

Senator **Nickles**. And so you would have some of those older contracts possibly renewing themselves, or coming up for renegotiation; and then you also have some new contracts that——

Mr. **Boswell**. Yes.

Senator **Nickles** [continuing]. They have let run.

Mr. **Boswell**. Yes.

It varies from company to company. I think you could find any producer, if he examined his own personal situation, would find he could sit on one side of the fence or the other.

But, on the average, I would say that your industry by and large is weighted toward older-term contracts.

The majority of your gas reserves are presently controlled by major oil companies. They are the ones that have the preponderance of the—I would say the older gas contracts.

Senator **Nickles**. Yes. Given the environment that you are in, so—that we find ourselves in, particularly in the Senate now, do you think the Senate should be moving towards and working in relation to what you envision, or possibly, say, well, what we are seeing from the administration or some of these proposals might do more damage than good, and let's just let NGPA run its course, and keep old gas contracts forever controlled?

Mr. **Boswell**. I would say that, you know, we should let NGPA run its course: that the price should be—control should be phased out over time; and that the——

Senator **Nickles**. On all gas?

Mr. **Boswell**. On all gas.

Senator NICKLES. That wouldn't—that's not letting NGPA run its course.

NGPA would decontrol basically all gas except for 104, or old gas, which would be forever under control.

Mr. BOSWELL. I think that it should all be uncontrolled—should be decontrolled; and that the contracts between the producers and the purchasers would be the natural mechanism for price escalation or decline in the future.

Senator NICKLES. OK. So what you are saying is that Congress should address the NGPA, but address it not from the aspects of abrogating any contracts or mandating reduction in take or pays or something along that line, but should be moving toward——

Mr. BOSWELL. Eliminating price controls.

Senator NICKLES [continuing]. Eliminating the price controls that would remain after January 1, 1985——

Mr. BOSWELL. Yes.

Senator NICKLES. OK. Well, thank you very much for your appearance before this committee.

Mr. BOSWELL. Thank you.

Senator NICKLES. Mr. Harrell?

STATEMENT OF KENT J. HARRELL, OWNER, HARRELL ENERGY CO.

Mr. HARRELL. Thank you, Senator Nickles.

My name is Kent Harrell. I am the owner of Harrell Energy Co. here in Tulsa. I have been an independent oil producer for the last 10 years, and engaged primarily in the exploration and search for natural gas.

By further introduction, Senator, I am on the board of directors of the 1,400-member Oklahoma Independent Petroleum Association, and am the current chairman of OIPA's natural gas policy committee.

[Whereupon, a discussion was had off the record.]

It is a privilege, Senator Nickles, to have the opportunity to address this committee on natural gas industry in general and President Reagan's proposed decontrol program.

I commend you and the commission for bringing in these hearings to the heart of the natural gas industry and to hold subsequent hearings in other areas of the country.

I am at least hopeful, and at best confident that what you hear and what you learn in these hearings will be taken back to Washington and interpreted into executive and legislative action to solve the problem in the best interest of all the parties.

Senator, I have submitted a written statement which is too long to go into, particularly what I would like to do here is just sort of off-the-cuff summarize that statement.

Senator NICKLES. Thank you.

Your statement will be entered into the record, in full, as written; and I very much appreciate your giving us a summary of it.

Mr. HARRELL. Thank you.

I had not met Mr. Boswell before, and did not know what his position was going to be, I might say. I find that I am very much in agreement with Mr. Boswell's contention. I applaud the President's and the administration's proposal to deregulate natural gas. I think we have all said many times that it's way overdue. It's in the best interest of the producer and the consumer to get a free market and allow the consumer to vote with his dollars, and allow and set the prices that he is willing to pay.

I applaud the President, and I think Secretary Hodel has attempted to be as equal as he can be in his original proposal. I was very much pleased with Mr. Cantrell's statement that there is some room for amendments or changes or discussions of that proposal.

The primary things that I agree with in the President's proposal, of course, are the repeal of the Fuel Use Act, freeing up of access to the—literally the nationwide transportation system for natural gas, and the repeal of incremental pricing.

Those things that I would disagree with are very similar to Mr. Boswell's in that I feel that the gas cap is simply a reimposition of controls. I abhore the abrogation of contracts, whether it would benefit me economically or not. I think that the unrealistic price controls, that is, inflation, only increases at the distribution point, could be counterproductive.

Senator **Nickles**. Counterproductive—do you mind me interjecting—counterproductive for producers or counterproductive for pipelines or——

Mr. **Harrell**. Counterproductive for both, Senator.

I have difficulty with a form or deregulation that says what we are going to do is we are going to take the regulation from the wellhead and we are going to move it to the distribution point, or, shall we say, the city gates.

It doesn't take very long to compute that if we are limited in what we can charge at the city gate, all you have to do is back out the transmission cost and the pipeline's profit, and you immediately have the wellhead price.

I think the market itself will take care of that. In fact, the one part of my proposal that I think is different than some others, I personally believe that there is sufficient protection mechanisms in the existing contracts to protect the consumer and at the same time allow the industry to go forward.

My point there is that all contracts are written by the pipeline companies. And they generally write them with a good deal of protection for both themselves and their consumers.

I suggest to the committee that the administration and Congress deregulate all natural gas upon the date of enactment. That would include 104.

But I agree with Mr. Boswell's contention that we allow all the contracts to stay in force. Most of these contracts are for a specific period of time.

If you allow them to run their natural lives under their current pricing mechanisms, you will decrease the opportunity for the, quote, flyup, that both the administration and Congress is concerned about; while at the same time phasing in a total deregulation of all natural gas by the action of the contracts' expiration, in other words, over a longer period of time.

The contracts that we look at—and I have looked at perhaps sometimes more than I would like to have looked at, Senator—the old contracts never contemplated deregulation, and their pricing mechanisms generally don't provide for such an event.

So, in order to let those contracts run their natural lives, the FERC would have to maintain for a period of time the nationwide area rates and the area rate pricing.

The intrastate contracts that we've had in the last 15 years or so generally do provide for an annual adjustment of prices. And that is an attempt to get those contracts and keep thm at current market clearing levels.

The interstate contracts entered into since 1974, under the NGPA, every one I have seen provides for a mechanism for pricing at deregulation.

All of these mechanisms involve—they are referred to very often as indefinite price escalators, but the purpose of these mechanisms is to keep that contract at the current market price.

The 107 contracts which seem to be giving many people a lot of trouble at the moment all contain, at least every one I have ever seen, contains a market out provision on behalf of the pipeline company.

Generally, those provisions say something to the effect that if the pipeline can not sell its gas at the prices that we are agreeing to buy it for in here, we, the pipeline, can come back to you, the producer, and give you an alternate price. And if you don't accept that alternate price, you have two choices. You can either accept it or you can go out and see if someone else will give you a better price.

If no one gives you a better price, then our alternate price is what you are stuck with, irrespective of pricing that might be put relative to No. 2 fuel oil or anything else.

I am saying that those mechanisms, if properly enforced by the pipelines, and if you let the 104 contracts—in fact, let all contracts run their course for their natural lives—you can have immediate deregulation today; and yet that deregulation will not impact adversely upon the consuming public nor on the industry.

I agree wholeheartedly with your statement in the beginning of this hearing. I have a great deal of trouble with the abrogation of contracts. I have some 104 contracts. I didn't like them when I signed them; I am not crazy about them now. But I did sign them and I am quite willing to live under them.

I think the same should be true with the pipelines.

I appreciate the opportunity to address this committee, and I appreciate your interest in the issues, Senator Nickles.

[The prepared statement of Mr. Harrell follows:]

Comments by Mr. Kent J. Harrell
Harrell Energy Company, Tulsa, Oklahoma

Before a Hearing of the U.S. Senate Energy and Natural Resources Committee
March 28, 1983
Tulsa, Oklahoma

Senator Nickles...ladies and gentlemen of the committee...my name is Kent J. Harrell. I am the owner of Harrell Energy Company, an independent petroleum exploration and production company based in Tulsa, Oklahoma. My petroleum operations, which date back to 1973, have primarily involved exploring for and producing natural gas in many sections of the Mid-Continent and Southeastern regions of the U.S. Since that time, we have drilled 520 natural gas wells in these areas, with 75 percent of them being drilled since the Natural Gas Policy Act of 1978 was enacted. As further introduction, I also serve on the Board of Directors of the 1400-member Oklahoma Independent Petroleum Association and am the Chairman of OIPA's Natural Gas Policy Committee.

It is a privilege, Senator Nickles, to have this opportunity to express my views to this committee concerning the natural gas industry in general and President Reagan's proposed natural gas deregulation program specifically. I must commend this committee for displaying its interest in this important matter by visiting the heart of the natural gas industry to hold this and subsequent hearings. We are, at the least, hopeful, and, at best, confident that what you have learned and will learn during these hearings will be be interpreted into Executive and Legislative action that is in the best interest of all parties involved in this issue.

Of course, the issue is natural gas. How much is there? How much do we need? What's the best way to get what we need, and how much will it cost?

Let me first state that there is NOT a shortage of natural gas supplies in this country, nor are we unable to deliver the natural gas to those who need it. We are now just barely using more natural gas each year than we are finding. Since 1977, we have been able to overcome the problem that resulted in the enactment of the Natural Policy Act and the Fuel Use Act in 1978--that problem being one of deliverability of natural gas. The abundance of new natural gas wells, especially deep wells, discovered since 1978 has enabled the industry to provide the necessary supply of natural gas needed to fill the pipelines and transport the gas to the consumers in all regions of the U.S.

Since 1977, 65 trillion feet of new natural gas has been discovered, and I must point out that 75 percent of these new reserves have been discovered by independent producers. To restate that, 25 percent of our total remaining reserves of some 200 trillion cubic feet has been discovered by the independent segment of the industry in just the last five years. This demonstrates how even the slightest easing of controls--such as that done for deep natural gas wells--and efforts to establish fair market or close-to-fair-market prices for natural gas can stimulate production. As a matter of fact, we independents have increased our percentage of total production from 38 percent in 1975 to 51 percent in 1981. At the same time, ownership of natural gas reserves by independents has grown from 36 percent to 45 percent. Independents are producing more and owning more natural gas today than ever before.

People want to know why natural gas prices are higher even though we have an abundant supply. Well, according to a recent report from the Department of Energy, wellhead gas prices represent only 45 percent of residential gas prices. The balance includes transportation and distribution costs. According to the DOE, the average residential natural gas price rose by 95 cents per million BTU during the last 12 months. Of this amount, increases in the wellhead price accounted for only 41 percent. The remaining 59 percent of the 95 cent increase was for pipeline and distribution costs.

The natural gas industry has reached its current levels during a period of regulation that dates back to 1938 with the Natural Gas Act; a period of absolute control over interstate markets that dates back to the Phillips Petroleum decision of 1954; and a period of absolute control over the intrastate market that dates back to the NGPA of 1978. That's 45 years of regulation and control on the natural gas industry, and I might point out that natural gas is the only energy resource still being price regulated today. Now, President Reagan and his administration are placing us at a new crossing--degregulation of the natural gas industry. A free and open market to produce our commodity and sell it for equitable value.

This country must have full and complete deregulation of the natural gas industry if we are to continue to have the necessary incentives to explore for and produce the quantities we need. We have already seen the benefits of deregulating crude oil. Crude oil prices and gasoline prices are lower and, with the help of a conserving America, we have a current oversupply of crude. There is nothing to indicate that the same will not occur when natural gas is deregulated and if deregulation occurs in a proper manner.

However, the actual proposal to implement deregulation which has been developed by Secretary Hodel, while well-meaning, actually calls for a one year extension of price controls--1986 when NGPA ends price controls in 1985--and a repressive pricing mechanism in the form of a "gas cap," which will artificially reduce new gas prices below market clearing levels until January 1, 1986. In my sincere opinion, these extended price controls and the "gas cap" will actually cause the "fly up" of natural gas prices on January 1, 1986, which is completely contrary to the Secretary's intent when deregulation takes place.

As I stated in a letter to you, Senator Nickles, the proposed deregulation plan would place oppressive powers in the hands of the pipeline companies as a result of mandated abrogation of existing contracts.

Senator, one of the foremost principles of a free marketplace is the right to enter into a contract to sell your product. And the second principle of a free market is the duty to honor those contracts. I do not see any substantiated relationship between deregulation of natural gas prices and the abrogation of existing contracts, nor do I endorse abrogation of existing contracts.

I have difficulty with a deregulation proposal that simply changes the method of controls and the place at which they are applied. And I have difficulty with a deregulation proposal that abrogates a contract between parties simply because the economic value of what they contracted for has changed.

President Reagan is understandably concerned about protecting consumers of natural gas as well as giving the petroleum industry a deregulated market in which to operate. As stated, I am opposed to the "gas cap" and the abrogation of contracts because I do not believe they will be beneficial to the consumers or to the industry. What I would suggest to this committee is that Congress immediately deregulate all natural gas...again I say all natural gas. However, keep all existing contracts in force. Let the deregulation be gradual.

I respectfully suggest that closer examination of the gas contracts now in existence will show that, overall, these contracts will provide adequate consumer protection if all natural gas is deregulated on enactment but gas subject to contract must remain under contract until that contract expires.

The old contracts never contemplated deregulation and therefore the Federal Energy Regulatory Commission will be required to set the old area rate prices or national area rate prices in order for these contracts to run their course. Intrastate contracts entered into since 1974 generally have some type of annual pricing mechanism which is designed to keep them at current market levels. All post 1978 interstate contracts that I have seen contain degregulation language which is designed to do the same. These types of contracts can function in a deregulated market immediately without F-E-R-C having to set prices. All post 1978 Section 107 contracts that I have seen contain market out provisions to adequately protect the pipeline and the consumer if the pipelines will simply enforce the provisions.

Going back to Secretary Hodel's proposal for a moment; there is one aspect concerning contracts with which I agree. In fact, I would go farther than the Secretary. The current proposal calls for a roll back of "take or pay" contracts to 70 percent. In other words, purchasers are only required to make an advance payment for 70 percent of what they promised to take from the reserves if they in fact do not take it at the specified time. I suggest to you that I and many like me in the industry would accept a roll back to as much as 50 percent on the "take or pay" contracts to help free up the transportation market for the natural gas we produce. The roll back on the "take or pay" contracts is the only alteration of contracts I could support.

Short of reducing the higher percentage "take or pay" obligations, as the President and Secretary Hodel have already suggested, I see no compelling reason to abrogate all contracts in order to provide for an orderly transition from a controlled market to a decontrolled market. By allowing existing contracts to run their primary terms, total price decontrol of all gas will automatically be phased into the marketplace without the "fly up" in price that would benefit neither consumer or producer. It will accomplish decontrol without destroying the "sanctity of contract," and will allow the consumer a longer time to adjust to market-priced energy while immediately allowing him to set the current market price by controlling demand.

The argument in support of abrogating contracts is based on the contention that natural gas is a commodity, and, as such, has an intrinsic unit value which should be the same whether it was discovered in 1953 or 1983.

However, the "commodity argument" misses a point. A natural gas well is a capital asset and when we contract to sell we are contracting to sell all or a part of that asset over a period of time. Let me use an analogy that may be more familiar:

Let's assume that as of 1975, I owned a business which I wished to sell. Knowing full well what the business is worth, or will bring, in the forseeable future, I contract with you, Senator, to sell my business for $120,000. To assure myself a fixed income, we agree that you will pay me the $120,000 at $1,000 a month for 10 years. Now, let's further assume that in 1980, the economy turned around and the product or service that my former company provides has increased in value tremendously. The business is now worth $600,000, or five times what I sold it to you for. I have every opportunity to go out and start a new business just like it to compete with you and try to take advantage of a better economy. Instead, I come back to you and say, "My business is worth more today than what I agreed to sell it to you for in 1975 and I want you to either give me an additional $480,000 for the company or give it back to me altogether. I seriously doubt that many people would say that you should give me the $480,000 simply because I don't like the deal I signed with you originally.

The opposite scenario should also be true. If economic conditions worsened in 1980 and the value of the business I sold you dropped below the $120,000 you agreed to pay, few people would say that I should refund your money.

A natural gas well is the same as my business example with one exception: In a gas well, we generally sell our asset and what it produces for a fixed period of time. At the end of that fixed period of time, we get, or should get, the remainder of our asset back and can then sell that remainder to anyone we wish at whatever the market will pay at that time. In the past, we, the producer, have not always been allowed to repossess our remaining asset and go again to the market. I am saying that this past practice was wrong. But it is no more wrong than for either party to try to break the contract during its original term.

Senator, the two points I am trying to make are: 1) Owners of old natural gas, as classified under Section 104 of the NGPA, have signed contracts for the sale of that gas. Why should they be permitted, through abrogation of those contracts, to take advantage of increased prices which have occurred since the contracts were originally signed; and 2) Pipelines should not be allowed to abrogate their more recent contracts to take advantage of what I and others predict will be declining prices for more recent discoveries of natural gas.

It is my contention that one of the major misconceptions about the natural gas industry is that the pipelines, which write all the contracts, have not and will not protect themselves and their consumers from undue price increases by the producers. This may have been true as long as the pipelines could rely on the Federal Power Commission or the F-E-R-C to do it for them. I suggest that without such federally mandated price controls, the pipeline companies, which never did roll over and play dead where the producer was concerned, will exercise their tremendous contract power to more than adequately protect their markets and, thereby, their consumers. I further suggest, Senator, that a closer examination of existing contract language will reveal that the pipelines already have the power to exercise price restraints. With the sure knowledge that as their old contracts expire they will lose the competitive edge of "cheap" price-controlled gas, they will take the necessary steps to insure their corporate survival by providing their customers with adequate supplies of natural gas at the lowest available price.

But the difference in the plan I have proposed and the one proposed by Secretary Hodel is that the "gas cap" and abrogation of contracts will in fact depress new drilling activity as an abundance of old natural gas reserves are brought on line at higher prices while new gas falls to below market levels...and these price controls will last a year longer and ultimately place us in a shortfall situation. Historically, we have seen that if independent producers cannot get a fair return for the high-risk investment we make, then we are not able to explore for new sources of energy.

Yes, ladies and gentlemen of the committee, deregulate natural gas as fast as you can, but please do not do so by abrogating contracts and by implementing an artificial "gas cap." The Hodel plan, and even other plans proposed by some Congressmen, could cause a tremendous shock to the system that would, in fact, increase consumer prices and decrease independent production activity which already is depressed by the conditions of the overall economy. Gradual deregulation resulting from the expiration, not the abrogation, of existing contracts and the roll back of "take or pay" contracts will give the President what he wants...a natural gas policy that is beneficial to the industry and the consuming public.

Again, I wish to thank you for granting me this opportunity, and I would be happy to answer any questions that you might have.

Senator NICKLES. Thank you very much, Mr. Harrell.
Mr. Marvin?

STATEMENT OF WHITNEY MARVIN, PRESIDENT, WHITMARE EXPLORATION CO.

Mr. MARVIN. Senator Nickles, my name is Whitney Marvin. I am the president of Whitmare Exploration Co. here in Tulsa.

We are a small independent operator. We drill primarily gas wells in southeast Oklahoma and northwest Arkansas, extending from McAlester, Okla., east to Russellville, Ark.

All of our gas is regulated by the Natural Gas Policy Act that's been drilled and produced since 1977, under category 103 and category 102, new or unexplored reservoirs and/or new wells drilled in [inaudible].

I agree with the concept of deregulation of the natural gas industry. I do not feel that the Natural Gas Consumer Regulatory Reform Act, as proposed by the current administration, accomplishes this.

I think, in essence, the gas cap imposes new regulations, which is really much more restrictive than we currently are under in the Natural Gas Policy Act.

The basic three reasons for my opposition, briefly—then I would like to go into a little more detail—I think the gas cap would effectively rollback prices substantially more than the $2.90 earlier mentioned. I think it could go as low as $1.50 to $2.25.

In doing this, they are going to deprive the thousands of independent producers who drilled their wells in anticipation of prices set by the Natural Gas Policy Act, the hundreds of thousands of mineral owners in this country who lease their minerals to the independent operators, in anticipation of prices set by the Natural Gas Policy Act, and the hundreds of thousands of investors in this country and worldwide who have invested in various publicly sponsored drilling programs, in anticipation of the prices set by the Natural Gas Policy Act. So the effects are tremendous.

I also think that the gas cap would effectively deter future drilling for new gas reserves. And I do have some statistics that I think can show that the so-called gas bubble could very easily be a gas shortage as early as 1985.

Third, I think that the Natural Gas Consumer Regulatory Reform Act proposes greater complexity and deeper Federal involvement in the natural gas industry.

Going back to the gas cap, and my concern on the new price in the gas cap, effectively what will happen, on the day of enactment, if the Natural Gas Consumer Regulatory Reform Act were to be enacted for 3 months, as proposed, independent producers and majors would be allowed to negotiate new sales contracts with pipeline companies throughout the country.

At the end of 3 months, these renegotiations for new contracts, or renegotiation for old contracts and negotiations for new contracts would be averaged out into a weighted average.

I think effectively what would happen for me, for my new gas wells and for the hundreds or thousands of other independents in the country, is not many new contracts would be negotiated. Rather, the pipeline companies would negotiate, renegotiate old contracts, currently at 25 cents, 45-cent levels, probably up to $1, $1.25, maybe $1.50.

The few new contracts negotiated, I would estimate, would be probably in the $2.50 range, which would be approximately the 102 price for gas in September 1982.

Currently we have approximately 200 trillion cubic feet of proven reserves in this country. That seems to be a hard number recognized by the Oil and Gas Journal, a number of different organizations that study oil and gas statistics.

Last year we consumed approximately 18 trillion cubic feet of gas. So that gives us, plus or minus, 10 years of reserves. That's just a fact. That's a number.

If we were to stop drilling for gas today and try to produce that 200 trillion cubic feet over the next 10 years, it couldn't be done. Every year the reservoir pressure of our gas in this country is declining, and the production capability of wells in this country is declining.

Currently the average production of the well in this country is 200,000 cubic feet a day.

The average reserve potential per well is eight-tenths of a pound per cubic feet.

I think a lot of people in this industry would even question that.

About 200 trillion cubic feet of reserves is estimated that approximately 130 trillion cubic feet is controlled by old gas, or is old gas controlled primarily by major oil companies, approximately 75 percent.

The other 70 trillion cubic feet is new gas, gas found since 1977, controlled primarily by independents.

The reason for the tremendous drilling rate for the past 4 years in the gas industry has been the Natural Gas Policy Act. In 1977, 11,000 wells were drilled. In 1982, 18,900 wells were drilled.

The gas price—the Natural Gas Policy Act set a standard that we all could live by, that we all could project our performance and economics by, to determine whether or not we wanted to drill a particular gas well; and also allowed our investing partners to determine whether or not they wanted to invest in us; and allowed the numerous royalty owner cooperatives now that have become very sophisticated in oil and gas economics to determine what rates, what bonuses they would lease their minerals for.

Because of that, the surge in gas drilling primarily by independents in this country has relieved the country of the shortage that we experienced in 1974, 1975, 1976, to where by 1981 for the first time since 1967 we found more gas than we consumed in this country.

In 1982 we found 17 trillion cubic feet of gas and consumed 18.

In 1981 we found 21 trillion cubic feet and consumed 19.

Today we have 2,000 rigs active in the country. Last year we averaged approximately 3,500 rigs. We are estimating this year we will find approximately 10 trillion cubic feet of gas, about half of what we found last year.

As far as my company is concerned, last year I had 82 employees. This year I have 38 employees.

Last year I drilled 82 wells. This year I will drill approximately 40 wells.

The reason for the slowdown in our drilling is a combination of factors. One, lack of investor confidence because of the OPEC concern over the price of oil; also, the proposed deregulation of gas, they are not sure exactly where the gas price will go; and the general bad press that the oil and gas industry has gotten over the past 12 months.

Assuming that next year, 1984, is as bad as 1983, we could estimate again that we will find approximately 7 to 10 trillion cubic feet of gas; and the potential deliverability in this country will be reduced to where we could be late 1984 or early 1985 in a deliverability shortage situation; not reserve shortage. We just talked—said we had 200 trillion cubic feet of gas. But the capability to deliver it is influenced every year as reserve pressures go down, as the potential of 81 wells to deliver goes down; we can deliver just so much.

The fewer wells drilled, the less deliverability we have. And I think it's a good estimate that we will be in a shortage situation, if the trend continues, by 1985, 1986.

I don't think that the gas cap that would effectively lower prices for the independents who effectively drill most of the reserves, have drilled most of the reserves here domestically, will do anything but deter production.

I think when you look back at how we based our economics on the Natural Gas Policy Act prices, our costs went up; proportionately with those prices we determined our costs therefrom, and drilled the wells that we felt the reserves satisfied.

Now that the independents have gotten the country out of a shortage, I think one effect of the proposed legislation would be very unfair to go back to the independent and say, we appreciate you getting us out of the shortage; now we are going to roll your prices back.

In effect, I think it would put a large number of independents in bankruptcy. There already are a large number of independents in bankruptcy.

When you look at it from a market level, I think the current market level for dry natural gas if it competes with any product, is—it's the substitutes that go into boiler fuel capacities, and it seems the most common substitute is No. 6 residual fuel oil.

Current price of No. 6 residual fuel oil is in the low $20. If you equate 6 Mcf of gas for every barrel of oil, which is a rough estimate, you are about $3, $3.50 per Mcf of gas.

That would seem to me to be a fair cap to impose on gas prices while we are waiting for the deregulation of 1986 to come, rather than rolling prices back to where, once again, they are regulated and kept lower than the market level.

What is going to happen then, come 1986? The price of natural gas is going to shoot up, back up to a market level, whatever then, probably, comparable would be No. 6 residual fuel oil.

In effect, that will create the same set of circumstances that we are trying to avoid today, or a radical increase in gas prices in a short period of time which would ultimately hurt the consumer.

Third, I think the—just the complexity of the Natural Gas Policy Act of 1977 has just now finally been interpreted by the majority of oil and gas producers and our attorneys and investors; and now we are coming up with a new set of regulations and new gas cap. And I think the end result is that it will just cause more confusion, less confidence in the market, and deter independents from drilling more wells.

I appreciate this opportunity.

Senator NICKLES. Thank you very much, Mr. Marvin. I appreciate both your statement and Mr. Harrell's statement. It's quite obvious that both of you have done a lot of homework in this field, and are quite knowledgeable. If we had more people in Washington, D.C., that had that expertise——

A couple of questions, I guess. Both of you were very critical of the abrogation of contracts as I have also. Both of you—both stated, as I have, too, that we want decontrol of gas.

Is abrogating the contracts or giving that 1 year potential of one party to abrogate under the administration's proposal, either party has the right after January 1, 1985, up until January 1, 1986, to abrogate that contract. So there is a 12-month period where you would have contracted abrogated, plus the immediate one party option to rollback, take or pays of 70 percent. So there's that, those two portions that deal with abrogating contracts.

Is that too great a price to pay for total decontrol of all gas by January 1, 1986?

Mr. HARRELL. In my opinion, no, Senator.

I might add that my point, of course, had been that you don't have to abrogate the contracts. The contracts will, in essence, protect you, if you leave them intact.

I failed to mention, as I recall, that one aspect of Secretary Hodel's proposal that I would agree with, and, in fact, I personally would be willing to go back further on, is the rollback of some arbitrary, and I think somewhat capriciously high take or pay obligations on the part of the——

Senator NICKLES. That you would support——

Mr. HARRELL. Yes, sir. I would. If we could free up the gas market and more equitably distribute the misery, if you will, I personally can live with rolling the take or pay provisions of my contract back below 70 percent; to something in the neighborhood of 60 or even 50.

Senator NICKELS. Are you aware there are some proposals that would—we have some proposals, too, and, incidentally, I will mention these, because I would appreciate other panelists today to possibly comment on some of the other gas proposals that are before Congress.

But some of the proposals would eliminate all take or pays entirely. Some of them rollback to other specified percentages. I think 50 percent is the other figure that I have mentioned.

And so if you have any comments, not only on Senate bill 615, but also on the other pieces of legislation that are before Congress, I—that would be appreciated also.

Go ahead.

Mr. HARRELL. Senator, to more directly answer your question, the answer is, yes, if we have to accept the abrogation of contracts, if we have to accept what in my opinion is going to give the pipeline companies rather excessive powers for the next 2 or 3 years to beat us to death with a club, it's still worth it to get the gas industry out from under the regulatory structure that it's had for the last 45 years. It's in the best interest of the industry as a whole; it's in the best interest of the consumer.

We may argue about the methods among ourselves as independents of how to do it. But I think you will find pretty much unanimity among the independents that deregulation as a goal, and as an immediate goal, is in the best interest of the country and of our industry and the consumers. So the answer to your question is yes, it is worth the price we would have to pay for it.

Senator **Nickles**. Mr. Marvin, do you care to——

Mr. **Marvin**. Senator Nickles, one point is that in the past year a number of independents and major companies have substantially renegotiated their contracts already.

Shell, Arco, Amoco have negotiated take or pay provisions under their contracts, and agreed to eliminate them or reduce the effect of the take or pays.

We have reduced the effect of take or pays on a number of our contracts. We have never tried to legally enforce a take or pay provision in a contract.

Whitmare and our partners produce approximately 15 million cubic feet of gas a day, primarily Arkansas-Louisiana Gas Co. We've got to get long with those people. They are our major purchaser of gas in the Arkoma Basin. And we are not about ready to try to enforce a contract in a particular well if we know overall we are getting a fair take for the gas we produce.

Also, I think, the market-out provisions of the gas, we do not have deep gas, but of the deep, higher-priced gas, almost every major pipeline company has effectively exercised their market-out clauses. And I think most deep gas now has been reduced from $8 down to 4½, $5 per Mcf. It's happened over different periods over the past 12 months.

I don't think that this winter was cold enough to see the ultimate effect of the reductions in the market out; but I think by next year the marketplace will see a tremendous effect that the pipeline companies have already been able to negotiate with the producers and market-out provisions in reducing prices.

I think the provisions in the contract and the pipeline companies, already voluntarily, to a large degree are taking care of the problem. There are a few exceptions, but I think the majority of them are.

Senator **Nickles**. Would you—given, again, I guess, the distaste or the dislike for Congress to say, yes, either party could opt out of the contract, is that too great a price, in your opinion, to have total decontrol by January 1, 1986?

Mr. **Marvin**. No; I don't think so.

I think we will be able to find a taker for our gas, especially if collateral with deregulation we create a situation where producers can negotiate contracts with end users, and request of the pipeline if they have the capacity to transport our gas for us.

I could sell my gas today, if I could get someone to haul it to an end user.

Senator **Nickles**. So you like that provision of the administration's bill that would say, yes, if one party did opt out, if the pipeline said we are breaking the contract that we had with you, or the gas cap came in 50 cents less than what you were getting for your gas, and you said, "Wait a minute, I want my—I want the original price": and they said, "Well, we are not going to pay you the price"; and so the contract is abrogated on January 1, 1985. Do you feel like maybe that that provision that they would have to carry your gas at an incentive rate would still give you an opportunity to go out and look for a buyer? And so, even though you don't like abrogating contracts, you still agree that the goal is very, very desirable toward eventual decontrol of all gas; and that that would be beneficial, even though it might have a negative economic impact on you.

Mr. **Marvin**. Right.

Senator **Nickles**. Let me ask you that direct question. And I appreciate, Mr. Marvin, your comments. You said that a year ago you had, what, 80 employees; and now you have 30 or——

Mr. **Marvin**. We have about 38.

Senator **Nickles**. Thirty-eight. What impact would the bill, as presently written, that would have a gas cap—and you mentioned the gas cap coming in at very low figures, and, incidentally, we have heard other people—we have heard all kinds of estimates of where the gas cap would come in. Some at figures that you have quoted; some at much higher figures. And I am not sure that anyone really knows. It kind of depends on the mix of contracts that are renegotiated; and how that mix will be determined would be between the two parties. If, as the bill is written right now, you could have immediate rollback to 70 percent of take or pays, would that be financially—well, you have already mentioned in your case that you are not enforcing take or pays, so it wouldn't be that substantial.

Mr. Harrell, would that rollback portion of that be that detrimental to you?

Mr. **Harrell**. No, sir, it would not.

And I might add, like Mr. Marvin said, we are not enforcing our take or pays at the moment, either.

Senator **Nickles**. Are you in deep gas?

Mr. **Harrell**. Yes, sir, quite a bit.

It makes no sense to most of the producers that if you try to force the pipeline to take something which they can't sell, that's a one-way trip for both of you to a disaster. And while there are some that are legally attempting to enforce high take or pays, I think many of us have backed away from this, and said, hey, let's discuss what the market really is.

For the first time, perhaps, in the last 3 to 5 years, the producer has begun to understand the direct relationship to his being able to sell his gas at the wellhead. Somebody has got to take, it at the other end of that pipeline. And I don't think any of us in the independent segment are in the business of attempting to put the pipelines into a situation of taking more gas than they can sell. We are not enforcing our take or pays. And, as I say, I would personally be willing to take rollbacks of 60—back to 50 percent, if that would equalize the market; and, as I said, share the misery among the producers.

Senator **Nickles**. Well, do you have producers that—or are there producers in the State of Oklahoma where we have quite a lot of 107 gas, that are highly leveraged?

I am thinking that we have had several. We've had some bankruptcies; we've had some near bankruptcies of some very large producers. And that while you may say that that 70 percent may not be of any real negative impact to you, or maybe you are renegotiating voluntarily, do we have a large segment of the gas industry in Oklahoma that, if forced or mandated to rollback to 70 or to some other figure, 50 or 60, that are highly leveraged, to the extent that possibly that might be the straw that would break the camel's back?

Mr. MARVIN. I think the key there, Senator Nickles, is in terms of the take or pay, if our takes go down, we can continue to shut down, lay more people off, cause more unemployment in the State of Oklahoma and elsewhere; we can continue to do that, if we had just barely enough, the minimum capital necesary to keep your accounting staff and the few staff you need to operate.

But what would be devastating and that would drive a large number of independents into bankruptcy would be if the gas cap came out at $1.50, all of the banks would come back and renegotiate credit lines.

Our credit lines are based on the future or the value of our future production. And that value is determined by outside independent engineers who come in and say, in the case of Whitmare, Whitmare has so many billion cubic feet of gas; we give it this value.

We go to the bank and put up those reserves as collateral to borrow additional funds to drill more wells.

If that value were to be cut in half or cut by a third overnight, due to a low gas cap, I am sure the banks would also be extremely confused and very anxious to invite all of their clients in to decide exactly what kind of collateral they have now, mortgaging their loans. And if it's worth half of what it was 2 weeks ago, it could be devastating.

It would probably be impossible for the banks to call all the loans, because they wouldn't get paid. But the independents, in essence, would all have—large number of them would have a negative net worth, and for all practical purposes they would be bankrupt.

Senator NICKLES. Would you care to touch on that?

I am concerned about this gas cap, and where it might come in, and if it does come in substantially less than the existing current market price, what effect that would have, particularly in light of the fact that we have seen some banks in Oklahoma have severe problems—Penn Square—and some producers having problems, or going bankrupt, and the number of firms in related industries that have. If this gas cap did come in substantially less, as Mr. Marvin estimated that it might, would you agree, Mr. Harrell, that it could be devastating on the independent producer section?

Mr. HARRELL. Yes, Senator, I would. And for the same reason mentioned. I think artifically reducing the prices is going to be more devastating than your initial question of what would happen if we reduced the take or pays.

One thing, if a company is leveraged so heavily that the enforcement of their take or pays in a short span of time is going to put them under, they are probably going to go under anyway, because many of the pipeline companies simply are not making the payments. You are going to have to go to court and sue them, and that's going to take a year or two to do. If the company is that heavily leveraged, it may be in severe trouble already, whether or not Congress mandates the reduction in take or pays or not.

But the reduction, especially an artificial reduction in price—and I personally believe that the action of the gas cap as it's now proposed can take it to $1.50; you know, 102 and 103 and 109 gas, we are limited by the current proposal to the lower of NGPA or the gas cap.

As far as 107 goes, we have already been reduced under our market-out provisions on that.

Senator **Nickles.** Well, given the possibility that the gas cap could drop the price that substantially—and I guess if there was a substantial renegotiation of old contracts.

But there would be some incentive for a producer to renegotiate under the old. But if he didn't have the counter—if he came out with the gas cap that much lower than present contract prices, do you think the bill as we have it today, if we weren't table to change the definition of gas cap, could be too detrimental or too high a price to pay for decontrol?

Mr. **Marvin.** I think so.

Another point, too——

Senator **Nickles.** So it would be better, possibly, not to have a bill, if we are going to go in with gas cap as presently defined.

Mr. **Harrell.** Better to have NGPA, it would be better to have NGPA.

Senator **Nickles.** It would be better to have NGPA as it is now, with its inequities, with its perpetual control of old gas, than to have the gas cap come in that low.

Mr. **Harrell.** That's right.

Mr. **Marvin.** One other point, Senator Nickles, too. We are not just talking about the independent producer. We are talking about the hundreds of thousands of mineral owners, and the individuals all over the country who have invested substantial numbers of dollars into the oil an gas investments, who are also relying on their share of the reserves, maintaining a value.

When you look at the ratio of old gas and new gas, obviously, the independents are going to get rolled back. Those who control the majority of the old gas are going to have a tremendous increase in price, anywhere from 25 cent's, $1, $1.25.

I think an interesting point in that, when those older reserves were drilled, they were drilled in anticipation of 25-cent type economics. And they anticipated those type economics.

It will be a tremendous windfall there.

For the new gas drilled, they were drilled in anticipation of the NGPA gas prices, and that will be a tremendous rollback.

I think the end result will be that there will be a transfer of billions of dollars from those oil and gas companies that produce new gas, taken away from them and transferred to those oil and gas companies who control the majority of the old gas in this country, a substantial amount of money.

Senator **Nickles.** Gentlemen, we appreciate your time. I have some additional questions, but we also have some other panelists that I would hope to get to.

Incidentally, for all of our panelists, if you would be willing to cooperate with this committee, we would like you to possibly submit some additional answers that we could kind of use to fill out some of the areas that maybe we weren't quite able to touch on, but I very much appreciate your statement's before the committee, and also your very frank and I think very thoughtful comments on this legislation.

Mr. **Harrell.** Thank you, sir.

Mr. **Marvin.** Thank you, Senator.

Senator Nickles. Thank you very much.

On the next panel is George Haney, who is chairman of the Oklahoma Fertilizer Manufacturers Association; and also Charles Hughes, who is vice president of Oklahoma Natural Gas.

Gentlemen, we welcome you, and we appreciate, your statements that you have submitted to us, I am very appreciative of that. A lot of homework, quite obviously, went into both of those statements, and so not only myself, but the committee will look forward to reviewing those.

I glanced over both of the statements.

Mr. Haney, do you have some opening remarks?

STATEMENT OF GEORGE W. HANEY, CHAIRMAN, OKLAHOMA FERTILIZER MANUFACTURERS ASSOCIATION; ACCOMPANIED BY BRADFORD KEITHLEY, COUNSEL

Mr. Haney. Yes, sir, I do.

Mr. Chairman, good morning.

My name is George W. Haney. I am appearing here today in my capacity as the chairman of the Oklahoma Fertilizer Manufacturers Association, or, as we call it, OFMA.

Our membership consists of Agrico Chemical Co., Farmland Industries, Kaiser Agricultural Chemicals Co., N-Ren Corp., and Oklahoma Nitrogen Co. Combined, these companies own and operate all of the fertilizer production capacity located in Oklahoma.

I am accompanied here today by Bradford Keithley, counsel to the OFMA.

We have submitted a written statement, and I will go through an oral statement which will be somewhat shorter.

Senator Nickles. Thank you.

Mr. Haney. The members of the OFMA are especially concerned about the price of natural gas. At today's price levels, natural gas costs represent approximately 85 percent of the total costs of production incurred by the OFMA members in their manufacture of basic nitrogen fertilizers. At such levels, the cost of natural gas obviously constitutes the primary determinant of the economic viability of the OFMA members.

I would note that while natural gas plays a large role in determining the economic welfare of the OFMA members, the OFMA members in turn play a large role in determining the economic welfare of the Oklahoma natural gas industry as a whole.

Except for electric generation, the members of the OFMA constitute the single largest gas consuming sector in the State of Oklahoma.

Combined, the members of the OFMA alone use approximately 90 billion cubic feet of gas per year, or roughly 13 percent of the total amount of gas consumed annually by all Oklahomans.

The OFMA members also play an essential role in determining the economic welfare of other gas consumers in the State. Through their gas purchases, the OFMA members generate 35 percent of the net operating income of the Oklahoma Natural Gas Co., the State's largest gas utility.

Because of the large share of ONG's costs which are borne by the OFMA members, it has been estimated that if the OFMA members were to cease their purchase of gas from ONG, the rates to ONG's remaining customers would increase by over $170 million a year, or roughly $1 per Mcf.

From its perspective as a major consumer of gas, the OFMA believes that the natural gas industry is becoming increasingly chaotic and unresponsive to market forces. Since 1978 we have seen the price of natural gas to Oklahoma consumers increase by over 94 percent. Within the last 90 days alone, the price of natural gas paid by the OFMA members has increased by over 8 percent, or at an annualized rate of 36 percent.

At the same time, the fertilizer market has been subjected to strong downward pressure by an overall reduction in demand for fertilizer products, coupled with the influx into the United States of cheaper imported fertilizer.

As we have seen on numerous occasions this past year, when the price of natural gas becomes too high, the members of the OFMA have been rendered noncompetitive and have been forced to shut down their facilities.

With gas prices expected to continue their incessant increase for so long as the current contractual and regulatory structure remains in place, such shutdowns must be expected to become even more frequent, unless steps are taken soon to reorder the gas industry.

Simply put, the price of gas to the OFMA members currently is substantially exceeding its market clearing level, and we believe will continue increasingly to do so, for so long as the NGPA and the unrealistic contractual provisions currently in use in the gas industry remain unchanged.

As we explain in greater detail in our written testimony, we believe that the only mechanism which will restore long-term order and stability to the gas market will be the complete, total and simultaneous deregulation of all gas by a date certain, coupled with the reformation of the unrealistic pricing and take or pay provisions which are currently in use throughout the industry.

We believe that such steps will lower the price of natural gas consumed in our fertilizer plants and, further, will lead to a gas market which will be flexible and responsive to long-term market forces. This will be to the benefit of consumers, pipelines, and producers alike.

We are concerned that if such steps are not taken, more will be put at stake than many have previously recognized. From our perspective alone, the failure to stabilize the gas market will carry with it significant consequences, both from a natural security and an agricultural policy standpoint.

For example, one consequence of the failure to come to grips with the chaotic gas market will be a dramatic reduction in domestic fertilizer production levels. These reductions in production by domestic producers will be replaced by increased imports from foreign sources of supply.

As a consequence, American agriculture will be required to become increasingly reliant on suppliers located in other, less secure locations, for the Nation's supply of fertilizer, one of the farmer's most basic production inputs.

Certainly in times of international stress, the American farmer and American agriculture in general will be vastly more vulnerable to foeign pressure than if the domestic fertilizer industry is able to maintain its vitality.

Another consequence will be that this Nation's gas producers, and specifically those located in Oklahoma, will lose one of their more significant markets. At a time when gas producers already are faced with a declining market, the further loss of the fertilizer market will result in even greater disruptions in large segments of the oil and gas industry.

A third consequence of the loss of the fertilizer producers and other industrial customers will be that those gas consumers which remain will be forced to bear even higher rates. This Nation already has experienced instances where the large-scale loss of industrial load by gas pipelines has forced those pipelines to recover their fixed costs through rapid increases in the prices charged to their remaining—and these are largely residential customers. The situation in Oklahoma is no different.

While the OFMA is not yet prepared to support any specific piece of legislation currently pending before the committee, we, nevertheless, note that many of the changes which I have described as being necessary to restore order to the gas market, are incorporated into S. 615.

Let me quickly add, however, that we believe that two essential elements currently are missing from S. 615.

First, S. 615 fails to treat intrastate consumers equally with interstate consumers. Although S. 615 provides for a limitation on the passthrough of gas costs to interstate consumers, and, further, provides such consumers with direct access to interstate pipelines on a contract carrier basis, it provides no similar protections to intrastate consumers.

If we are truly to restore order to the entire gas market, such protections must be afforded all consumers. Certainly, we intrastate consumers in Oklahoma are just as much in need of such protections as are interstate consumers.

Second, S. 615 fails to provide for the insertion of market forces into all segments of the gas industry. Although the bill provides for the renegotiation and, if necessary, marketing out of producer-pipeline contracts, it contemplates no similar arrangement between pipelines and end users.

Unless end users are able to renegotiate their contracts with their pipeline suppliers, in order to insert into such contracts realistic economic limitations, we have little confidence that pipelines will have a sufficient incentive to renegotiate their contracts with producers in a manner which will best serve the interests of their customers over the long run.

Certainly, we end users in Oklahoma are concerned that unless we are able to insert into our contracts with ONG price and other limitations, the revised contracts that ONG negotiates with producers under S. 615 wil will still not reflect real world economic considerations.

We believe that these hearings and the abundance of legislative proposals put before the committee demonstrate agreement with us that the present regulatory and contractual scheme is not working. We look forward to working with the committee to find the appropriate solutions.

I appreciate this opportunity to appear before you today, and will answer any questions you might have.

[The prepared statement of Mr. Haney follows:]

HEARINGS ON
PENDING NATURAL GAS LEGISLATION

STATEMENT OF
GEORGE W. HANEY, CHAIRMAN
OKLAHOMA FERTILIZER MANUFACTURERS' ASSOCIATION

MARCH 28, 1983

MR. CHAIRMAN, MEMBERS OF THE COMMITTEE:

Good morning. My name is George W. Haney. I am the current Chairman of the Oklahoma Fertilizer Manufacturers' Association (OFMA). I also am the plant manager of Farmland Industries' fertilizer production facilities located at Enid, Oklahoma.

The OFMA represents the interests of all of the fertilizer manufacturers located in Oklahoma. Its membership includes Agrico Chemical Company, Farmland Industries, Inc., Kaiser Agricultural Chemicals Company, N-Ren Corporation, and Oklahoma Nitrogen Company. My remarks here today are made in my capacity as Chairman of the OFMA and are on behalf of that organization. The OFMA appreciates this opportunity to appear before the Committee and to provide it with the OFMA's thoughts on natural gas legislation currently pending before the Committee.

The OFMA has long been concerned that the natural gas industry increasingly is becoming disordered under the current regulatory scheme and that changes must occur to that scheme if rational economic decisions are to be made in the future by the members of the OFMA and others affected by the price and availability of natural gas. While the OFMA is not prepared at this time to support any specific piece of legislation currently pending before the Committee, we nevertheless note in general that many of the basic principles which we endorse for change in the current regulatory scheme (and which I will discuss further below) are incorporated into S.615.

I. INTERESTS OF THE OFMA

I will begin my remarks by noting briefly what the interests of the OFMA are with respect to natural gas.

Although it may be of some surprise to the Committee, the overriding concern of most fertilizer manufacturers today -- certainly those of us located in Oklahoma -- is the availability and price of natural gas. While there are other issues about which we as fertilizer producers are concerned, none of those issues carry with it the same degree of seriousness as does natural gas.

The reason for this is simple. Natural gas is the basic ingredient used in the production of nitrogenous fertilizers. Because natural gas is used as a feedstock for its chemical properties, there is no reasonable substitute for it today in the production process. Simply put, without natural gas, we are unable to produce the nitrogen fertilizer products which are basic to the production of wheat, corn, cotton, rice and forage crops by the American farmer. Thus, the availability of reliable supplies of natural gas is of paramount importance to the fertilizer producer, and, through him, the American farmer.

As important as is the availability of natural gas, however, the price of the natural gas supplies which we acquire is even more vital. At today's price levels, natural gas costs represent 85 percent of the total cost to the Oklahoma manufacturers of producing basic nitrogen fertilizers. (See Attachment A.) This is about average fcr the industry as a whole. As a result, natural gas costs today are the key ingredient in the determination of whether a fertilizer producer remains economically viable. As we have seen on numerous occasions this past year, when the price of natural gas becomes too high, fertilizer producers are rendered non-competitive and are forced to shut-down their facilities.

It should be noted that, except for electric generation, the members of the OFMA constitute the single largest gas consuming sector in the State of Oklahoma. Combined, the members of the OFMA alone use approximately 90 billion cubic feet of gas per year, or roughly an amount equal to half of the total amount of gas consumed annually in the entire State of Kentucky.

With this background, it is simple to understand that the members of the OFMA have a large stake in the policy which this nation may elect to adopt with respect to natural gas.

II. THE CURRENT STATE OF THE FERTILIZER INDUSTRY

To put the OFMA's position on natural gas in perspective, let me briefly provide you with an overview of the current state of the domestic fertilizer industry. To put it bluntly, it is bleak.

Nationally, it has been estimated that there is approximately 19-20 million short tons of domestic fertilizer production capacity. Currently, only about 12 million short tons (or only 63 percent) of that capacity is operating. The remaining plant capacity has been closed.

Of course, there are a number of reasons for these closures. The current condition of the American agricultural sector, the Administration's payments-in-kind (PIK) government assistance program, and record fertilizer producer inventories have severely depressed the farm market for current fertilizer production, at any price.

In addition, increased imports of foreign-produced fertilizer (produced from more cheaply valued foreign gas reserves) have served significantly further to impair the already reduced market position of the domestic fertilizer producers. But there is today no more damaging a factor to the domestic fertilizer producer than the recent rapid and uncontrollable increase in the price of his natural gas feedstocks.

Simply put, with the cost of their most basic feedstock increasing inexorably, many fertilizer producers recently have been forced to incur production costs which are substantially in excess of the price at which imported fertilizer can be acquired on the open market. Obviously, with such high production costs (relative to prices for competitive products), the ability of the domestic producer to reduce prices in order to meet competition has been limited. The ultimate consequence in many instances has been the closure of the domestic plants.

The Oklahoma fertilizer producers have not been immune to this affliction. Since 1978, the price of natural gas to the OFMA members has increased by over 94 percent. Indeed, the price of natural gas has increased by approximately 8 percent in the last 90 days alone. With our gas costs escalating as rapidly as any in the nation, we have seen production from Oklahoma plants repeatedly curtailed in the recent past as increasing production costs have rendered these plants non-competitive. Recent testimony presented before the Oklahoma Corporation Commission by Dr. Raymond Daniel, Vice President of Chase Econometrics, indicates that this trend will only worsen if natural gas costs continue their incessant climb to yet higher levels.

Although it is a matter which need not be fully developed in these proceedings, I would note that such a continued deterioration in the viability of the domestic fertilizer industry carries with it severe national security implications. Because the foreign suppliers which are displacing these domestic producers are in many instances located in countries with foreign policy goals far different from those of the United States, the consequences of developing a dependence on such suppliers for this basic input to the American agricultural industry may be extremely serious.

This curtailment of production by the Oklahoma fertilizer producers, and the consequent reduction in the demand for gas by the members of the OFMA, has affected not only such producers' economic condition but also that of other gas consumers. For example, in Oklahoma, 30 percent of the load served by the state's largest gas utility -- Oklahoma Natural Gas Company (ONG) --

historically is fertilizer related and 35 percent of ONG's net operating income is derived from such sales. Recent testimony before the Oklahoma Corporation Commission indicates that the recent reduction in the level of such sales (due to reduced fertilizer production) is in large part responsible for the recent $88.4 million rate increase requested by ONG. Further evidence indicates that, if the fertilizer manufacturers served by ONG are forced totally to cease production, the price of gas to the utility's remaining consumers will increase by as much as $170 million, or an additional $1/Mcf to make up for the resulting revenue deficiency.

Such adverse impacts of the loss of the fertilizer load are not limited only to the other consumers served by the utility. In 1980 (the most recent year for which data currently are available) approximately 13 percent of all gas consumed in Oklahoma was used by the fertilizer industry. Given the size of this load, it is apparent that, as the fertilizer industry is rendered increasingly non-competitive due to high gas costs, many Oklahoma gas producers will find the demand for their product even more depressed than currently is the case.

III. POSITION OF THE OFMA ON THE DEREGULATION OF NATURAL GAS

With this prologue, you might expect that the OFMA is here today to argue for increased price regulation of natural gas. After all, whenever the price of natural gas historically has increased rapidly, the response has been to impose more government regulation over prices, not less. Contrary to such expectations, however, the OFMA urges that the Congress move rapidly to dismantle the current regulatory scheme governing the price of natural gas.

A. The Current Disorder

It is the OFMA's experience that the governmental regulation of natural gas under the Natural Gas Policy Act of 1978 (NGPA), coupled with the effect of certain contractual provisions which fail to reflect current market conditions, today are serving only artificially to "prop-up" the price of natural gas. Put simply, it is the OFMA's experience that it is the presence of governmental price regulation -- not the absence of greater regulation -- which today is causing gas prices to increase.

Today, natural gas prices in many parts of the country -- including Oklahoma -- have reached or exceeded their "market clearing" level. Certainly, with respect to the members of the OFMA, gas prices have reached the level where, as they continue to increase, increasingly greater shares of the Oklahoma fertilizer industry are being idled. Yet, under the NGPA there appears to be no prospect in sight of avoiding even further price increases.

In the OFMA's opinion, if the NGPA is not changed, the "maximum lawful prices" permitted to be charged for gas will continue to increase ultimately to price levels well beyond the value of the gas to the consumer. Through the operation of the "indefinite price escalation" provisions common to most gas purchase contracts, delivered gas prices to the consumer will continue to track those NGPA increases, even as the pipelines paying such prices continue to lose large segments of their customer loads.

B. The Causes of the Current Disorder

The OFMA is convinced that the inability of the gas market to respond in a economically rational manner to current economic conditions is the result neither of a lack of desire nor of effort on any one party's part, but, rather, is the logical consequence of a regulatory and contractual environment which has stifled the efficient operation of the market. The OFMA's experience has demonstrated that, no matter how diligent the effort of any segment of the industry to reassert the presence of economic realities in the gas market, the market will not respond until an external force acts finally to clear away the 35-years' accumulation of regulatory and contractual barriers which currently exist.

For example, given the size and importance of the OFMA members to ONG, in a free market economy (such as exists for fertilizer) it might be expected that, as the OFMA members considered ceasing (or significantly decreasing) their production due to high gas costs, ONG and its suppliers) would immediately seek means by which to lower such costs. Reduced demand for gas in a time of surplus would result in reduced prices. Certainly, as the OFMA members and other large-volume customers would begin to be priced out of the gas market, suppliers in that market would lower their prices in order to preserve their revenues.

The OFMA's experience is exactly the opposite, however. Although the OFMA members have remained in constant communication with ONG during the past few years and have constantly advised it of the effects which increased gas costs are having on such members' competitive viability, ONG and the OFMA have found themselves virtually prohibited by existing contractual and regulatory barriers from adjusting their various relationships with each other and ONG's suppliers to reflect this current economic reality.

It is apparent from the OFMA's experience that, during the past 35 years of regulation, the various segments of the gas industry have grown lax in including in their contracts provisions which serve to ensure that such contracts will continue to reflect the real-world economic considerations important to each party throughout their term. It is the OFMA's experience that the failure to include such safeguards largely has been brought about by the increasing presence of regulation. Simply put, under the regulatory scheme which has heretofore existed, gas historically has been priced so far below its true economic value that neither the producer, nor the pipeline, nor the consumer has considered it either necessary or appropriate to expend their limited negotiating power in order to insert safeguards in their contractual relationships which force those relationships to reflect market conditions.

C. The Response Needed to Alleviate the Disorder

Through the confluence of a number of factors, the gas market now has been brought face to face with real world economics. Gas no longer is an under-valued commodity in the market -- indeed, it fast is becoming an over-valued commodity. As a result, the different segments of the industry no longer can rely solely on the artifice of regulation to define the economic considerations which are important to their contractual relationships. If they are to function efficiently, each industry segment will have to take the responsibility for defining the limits of the economic considerations which are important to it explicitly within the terms of its contracts.

It is the OFMA's belief that, in order to provide the different segments of the industy with the opportunity to inject such considerations into their contracts, governmental intervention will be required. As the OFMA's experience demonstrates, although each segment of the industry is fully aware of the nature of the problems faced by the industry, it either acting alone or in concert with other segments will be unable adequately to resolve the root cause without such intervention.

While the OFMA argues that governmental intervention is required in order to commence the readjustment of the industry to current economic conditions, it nevertheless emphasizes that such intervention must be as minimal as possible and should be designed only to: (1) provide some immediate semblance of economic order to the industry so as to stabilize the industry while it undergoes the transition to current economic reality; (2) eliminate artifical barriers to the efficient economic operation of industry; and (3) provide each segment of the industsy with adequate tools to enable it to make the transition from its current regulatorily-constrained environment to economic reality. The OFMA believes that, once the artificial barriers to the market are removed and each party is permitted the opportunity to insert into its contracts those provisions which enable it to protect the economic characteristics of its contractual relationships most important to it, no useful purpose will be served by continued regulation.

Indeed, the OFMA believes that any continued regulatory constraints will only serve one day again to disrupt the industry as real-world conditions deviate from the assumptions underlying such regulatory conditions. As the gas industry has proven time and again during the past 35 years, no regulatory scheme -- no mater how flexible -- adequtely can adjust to changes in market conditions sufficiently rapidly so as to prevent the creation of distortions.

While the OFMA has not endorsed any of the several proposed changes to the current natural gas regulatory scheme presently pending before the Committee, it does endorse the set of principles on the issue which has previously been adopted by The Fertilizer Institute (TFI), the fertilizer industry's national trade association. The OFMA believes that any legislation which incorporates these principles will fully meet the goals of (1) restoring an immediate semblance of economic order to the gas market, (2) eliminating artificial barriers to the efficient economic operation of the industry, and (3) providing each segment of the industry with adequate tools to enable it to transition to a free market.

The set of principles are set forth in the following resolution on natural gas decontrol adopted by TFI on November 5, 1982:

POSITION OF THE FERTILIZER INSTITUTE
ON NATURAL GAS DECONTROL

(Adopted Novemer 5, 1982)

BE IT HEREBY RESOLVED THAT:

1. The continuation of the Natural Gas Policy Act is the least desirable form of natural gas decontrol for the fertilizer industry.

2. The most desirable form of decontrol would be:

   A. phased decontrol of all categories of natural gas by a date certain, and

   B. the voluntary revision of the indefinite price escalator and take-or-pay provisions of purchase contracts between pipelines and gas producers.

3. the future competitiveness of the industry would be enhanced by:

   A. establishing a mandatory mechanism to allow fertilizer producers access to pipeline systems in order to enable the movement of gas that they can purchase from the point of purchase to their plants, and

B. allowing unrestricted access to natural gas under expired contracts and natural gas in the Outer Continental Shelf.

IV. THE IMPLICATIONS OF THE FAILURE TO DEREGULATE NATURAL GAS

If the Congress does not move expeditiously to restore order to the natural gas industry along the lines which I have described above, we in the fertilizer industry foresee several severe ramifications.

First, and most obvious, there will be a dramatic reduction in domestic fertilizer production levels. Simply put, with high gas costs, domestic producers will not be able to continue to compete with cheaper imported fertilizer. In short, American fertilizer will be supplanted by foreign sources of supply.

Second, the supplies which supplant the domestic producers will come from countries which in the past have proven to have national policies far different from our own. As a result, in the absence of domestic suppliers, the American farmer will be required to rely for one of his most basic production inputs -- fertilizer -- on suppliers located in other, less secure locations. Certainly, in times of international stress, the American farmer -- and American agriculture in general -- will be vastly more vulnerable to foreign pressure than if the domestic fertilizer industry is able to maintain its vitality.

Third, this nation's gas producers will lose one of their more significant markets. In Oklahoma alone, the fertilizer industry purchases approximately 13 percent of the total gas consumed in the state, and more than 30 percent of the gas sold by ONG, the state's largest gas utility. (See Attachment B.) At a time when gas producers already are faced with a declining market, the further loss of the fertilizer market will result in even greater disruptions in large segments of the industry.

Fourth, in those areas where the fertilizer producers represent a large segment of the total market, their loss will result in even higher rates to those gas consumers which remain. This nation already has experienced instances where the large-scale loss of industrial load by gas pipelines has forced those pipelines to recover their fixed costs through rapid increases in the prices charged to their remaining (largely residential) customers. The situation in Oklahoma is no different. It has been estimated that the loss of the Oklahoma fertilizer load could result in an increase in the rates charged to the remaining customers of Oklahoma Natural Gas Company by as much as $1/Mcf.

Fifth, the loss of the fertilizer producers will severely impact the economies of the states and localities in which they are located. The fertilizer industry is a high-technological, capital intensive, and well-paid industry. The loss of these facilities due to artificially high gas costs will deprive the host states and localities of well-paid employment opportunities, a solid tax base, and an important source of business for other segments of the economy.

Sixth, the incentive to explore for and produce new gas supplies for the future will be impaired. With the continued loss of the fertilizer and other industrial markets due to excessive prices, gas producers will find that their current sales of gas will continue to decline. The resulting loss of cash flow and continuing gas glut will send clear (although wrong) signals to the market to decrease further expenditures on future exploration and development. Ultimately, such distorted signals may lead to a major gas shortages.

V. FURTHER CONSIDERATIONS

I would like to offer two additional considerations which we believe that the Committee should bear in mind as it deliberates on this subject further. They are (a) the need to ensure that any "consumer protection" provisions which may be incorporated into any legislation adopted by the Congress treat interstate and intrastate consumers equally; and (b) the need to place in the hands of all consumers (both interstate and intrastate) the same market reordering tools as may be placed in the hands of pipelines and producers.

A. Protection of Intrastate Consumers.

The Committee should be aware that intrastate consumers are an important segment of this nation's industrial base. According to testimony previously presented before this Committee, in excess of 35 percent of the nation's industrial-related requirements for natural gas currently are being met from intrastate sources of supply. Intrastate sources of supply are even more important to the basic petrochemical and agricultural industries. We are advised that the primary petrochemical manufacturing facilities located in Louisiana and Texas alone represent 70 percent of this vital industry's total domestic productive capacity and that in excess of 60 pecent of the nation's total domestic nitrogenous fertilizer capacity is located on intrastate systems.

Of course, we as Oklahomans have a special interest in the interests of intrastate consumers. The two largest electric utilities in the state both rely on intrastate gas for substantial portions of their fuel and Oklahoma Natural Gas Company, the state's largest gas utility, is wholly an intrastate pipeline.

It is apparent that intrastate consumers have been as adversely affected by the disorders which currently plague the natural gas industry as any in the nation. Within the past two years, vast portions of the fertilizer industry located in Louisiana (which alone represents in excess of 30 percent of total U.S. capacity) have been rendered non-competitive due to high gas costs. While that portion of the fertilizer the industry located in Oklahoma has only recently been forced to face similar problems, recent proceedings before the Oklahoma Corporation Commission reveal that increasingly higher gas costs also are about to render our facilities economically non-viable. Many of the same conditions currently are being faced by others in the chemicals industry served from intrastate souces of supply.

While most legislation currently pending before the Committee recognizes the current disordered conditions faced by the industrial and other consumers served indirectly from interstate systems and, as a result, affords them certain protection from higher gas costs during the transition of the gas industry to a free market, most such legislation is devoid of similar protections for intrastate consumers. Further, while certain of the bills currently pending before the Committee afford interstate consumers the ability prospectively to acquire supplies in the field and arrange for their transportation to their facilities without difficulty, few make similar provisions for intrastate pipelines.

As we have seen under both the Natural Gas Act and the Natural Gas Policy Act, serious competitive disparities arise when artificial distinctions are made between gas producers, pipelines and consumers based solely on whether they are served from interstate or intrastate systems. Accordingly, we urge the Committee as it proceeds on this issue to resist the temptation to continue to make artificial distinctions between the rights and protections afforded interstate and intrastate consumers. Specifically, we urge the Committee to include in any legislation provisions which include equal protections and rights for interstate and intrastate consumers alike.

B. Reordering the Pipeline-Consumer Relationship

The Committee should be aware that, just as there exist "indefinite price escalator" and "take-or-pay" obligations between pipelines and producers, similar obligations exist between pipelines and end-users. The historical derivation of such clauses in pipeline-end user contracts is the same as is the case for their existence in producer-pipeline contracts. Simply put, under the regulatory scheme which has heretofore existed, gas historically has been priced so far below its true economic value that neither the producer, nor the pipeline, nor the consumer has considered it either necessary or appropriate to expend any degree of their limited negotiating power in order to insert safeguards in their contracts which force those contracts to reflect current market conditions.

The gas industry now has come to realize that, in the future, contracts must include provisions which will insert into those contracts market realities. No longer will the parties be able to rely solely on the artifice of regulation to define the economic realities which are important to the relationship of the parties.

Most legislation currently pending before the Committee only goes half of the way in enabling the relevant parties to revise their current contractual relationships to reflect these conditions, however. Such legislation leaves totally untouched the relationship between the pipeline and the consumers.

Without providing for the renegotiation of the pipeline-consumer relationship at the same time as the producer-pipeline relationships are being renegotiated, the Congress may find that, for all of its efforts, the goal finally to impose market realities on the gas industry will remain unmet. Pipelines with contracts obligating their customers to "take-or-pay" for gas and pay rates based upon "indefinite price escalator" provisions will have little real incentive to take "tough" positions in the renegotiations of their gas purchase contracts with producers. Even if such pipelines are inclined to take "tough" positions, they might forego the interests of certain of their customers if they consider it necessary to meet the needs of their remaining customers.

Certainly, pipelines which have contracts obligating their customers to "take-or-pay" requirements will be little inhibited by any "contract carrier" provisions which any legislation enacted by the Congress may contain. Even if a customer wants to utilize the "contract carrier" provisions, it still will be bound to meet its "take-or-pay" obligation to its pipeline supplier. Thus, consumers seeking to obtain contractual relationships which better safeguard their economic interests will be severely inhibited.

Accordingly, we urge the Comiteee as it proceeds on this issue to create the opportunity for the full insertion of market forces into the entire gas industry. Specifically, we urge that the Committee include in any legislation provisions which contemplate renegotiations between pipelines an end-users.

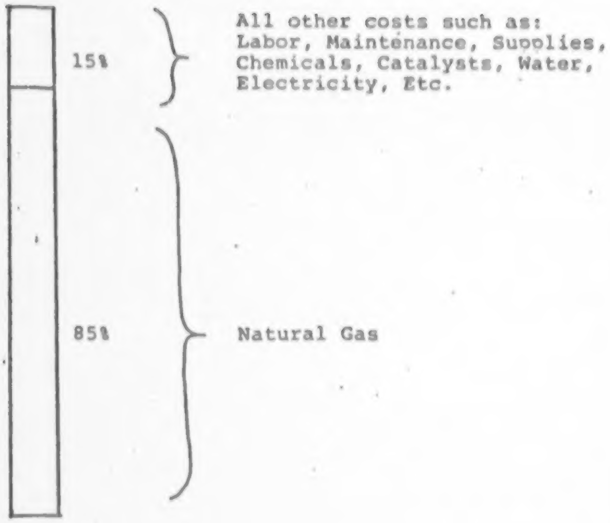
VI. SUMMARY

In view of the ramifications which will occur if the natural gas market is not permitted to function unencumbered by regulation in the near future, we are of the opinion that it is imperative that this nation's energy policy, as codified by law, be modified to encompass the total deregulation of natural gas -- coupled with the reform of unrealistic contract provisions. This is the policy of not only the OFMA, but also of the entire fertilizer industry.

As I have attempted to describe briefly, we believe that success on this issue will form the basis not only for sound energy policy, but also the basis for sound agricultural and national security policy as well. Although many may believe that the siren song of continued or re-regulation is the better answer, the OFMA's experience is to the contrary.

ATTACHMENT A

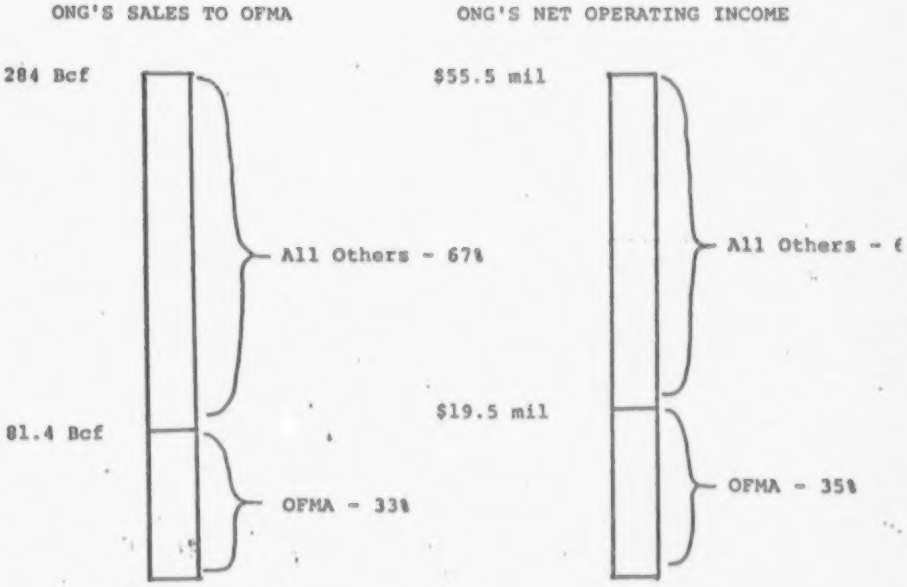
AVERAGE COST OF OKLAHOMA AMMONIA PRODUCTION



SOURCE: Ernst & Whinney OFMA Survey

ATTACHMENT B

RELATIONSHIP OF OFMA TO ONG



Source: ONG Data Provided In OCC Cause Nos. 27347 and 28069

Senator NICKLES. Thank you very much, Mr. Haney.
Mr. Hughes.

STATEMENT OF CHARLES F. HUGHES, JR., VICE PRESIDENT, GAS SUPPLY, OKLAHOMA NATURAL GAS CO.

Mr. HUGHES. I am Charles F. Hughes, Jr., vice president of gas supply for Oklahoma Natural Gas Co.

ONG appreciates this opportunity to testify on legislative proposals to address current problems in the natural gas market.

Particularly, we would like to thank the committee and Senator Nickles for making a forum on this important issue available here in Oklahoma.

ONG has previously filed a written statement, and I would like to summarize that statement now.

ONG is the largest intrastate pipeline in Oklahoma. We obtain all of our gas instate and sell to a wide assortment of customers ranging from residential and small commercial users to large industrial plants and other pipelines who purchase the gas pursuant to section 311 of the NGPA, and transport the gas outside the state for resale in other market areas.

ONG is fortunate to have been able to maintain relatively low gas costs in recent years. But we are concerned about growing dislocations in the natural gas market, unless appropriate legislation is enacted.

It seems that all sides of the natural gas issue agree that we are facing serious problems. Federal regulations on natural gas simply have not worked. The producer regulation under the Natural Gas Act resulted in artificially low prices that inflated demand, and stifled exploration and production efforts.

This culminated in serious shortages and curtailments in the interstate markets during the 1970's. Congress reacted with the Natural Gas Policy Act of 1978, which was intended to boost interstate supplies through incentives and deregulation provisions.

NGPA did work to increase available gas supplies. In fact, we now have a deliverability surplus. But the NGPA, coupled with postshortage contracting practices and recent economic events, has wreaked havoc with natural gas pricing.

Under the scheme now in place, prices go up automatically, but in most cases have no way of coming down to meet market realities. Thus, we are dealing with everincreasing prices in the face of declining demand. Frankly, this doesn't make sense. And it is bad for everybody: consumers who can't afford to buy gas, and pipelines and producers who can't make money because they can't find markets for their gas.

Although we at ONG have not been as adversely affected as some pipelines, we do buy gas subject to NGPA wellhead pricing rules, and we are feeling the dislocations in natural gas markets.

ONG has lost industrial loads because customers can not afford high gas prices during the current economic recession. More generally, we have lost section 311 sales to interstate pipelines because the general disarray in the natural gas markets makes it impossible for the interstate purchasers to retain their market share.

In short, we see a serious problem that needs to be addressed before it becomes a real crisis for the natural gas industry, and for the economy at large.

What should be done? Commonsense indicates that it is in everybody's interest, consumer and industry alike, for gas prices to reach marketable levels. Years of experience with various kinds of Federal regulation of wellhead prices have shown that Government intervention results in undersupply or oversupply and prices that are either unrealistically low or too high.

Having operated efficiently in unregulated intrastate markets, we have reason to believe that the answer is eventually deregulation. It worked for us and our customers before enactment of the NGPA, and it ought to work for national gas markets, both interstate and intrastate.

It is clear that market forces, not regulation, should dictate prices, so that the price mechanism can operate freely to bring supply and demand into balance.

Thus, ONG endorses the administration's ultimate free-market approach and supports the eventual elimination of all Federal price and nonprice regulation of wellhead sales of natural gas.

ONG does not support, however, decontrol or producer cancellation of pre-NGPA contracts until the original contract term expires.

It is equally clear, however, that the pricing structure now in place is not responsive to current market forces, because of all the contractual entanglements stemming from the period of Federal regulation. Accordingly, ONG supports the proposition that a statutory market-out provision is needed to bring about renegotiation of wellhead contracts to reflect current economic realities. Such a provision, however, shoud be a means for the purchaser who must, in fact, deal with the market to adjust the price to market levels.

It should not, as with the administration's proposal, offer the seller a cancellation right, irrespective of market realities. However, we concur with the administration's proposal that if the purchaser and seller are unable to agree on new contract terms after the purchaser exercise the market out, the purchaser should be required to transport, subject to certain conditions, the seller's gas to another pipeline or local distribution company contractually able and willing to purchase the gas.

As part of the transition to a free market, we also generally endorse the administration's concept of a gas price cap mechanism. Nonetheless, the gas cap should be refined in three ways, if it is to approximate the market value.

First, the cap should be determined by reference to prices and new contracts only, not prices in a combination of both new and renegotiated contracts, which may reflect the prior relationship of the contracting parties more than the present market conditions.

Second, the cap should be determined on the basis of prices in a regional producing area, which is more representatives of what a purchaser in that area should pay, rather than on a national basis.

Third, the cap should be based on prices and volumes actually sold and delivered, not estimates.

In conclusion, ONG feels strongly that the way out of the problems now facing the natural gas industry and its customers is eventual deregulation with appropriate market out provisions.

In this way, the market can operate to put supply and prices back into balance. This, as opposed to reregulation, price freezes, or other forms of regulation will better serve the public.

Senator, that's the end of my summary of our paper. However, I would like to reply to one of the statements made by a previous witness, if that's all right.

Senator NICKLES. Sure.

Mr. HUGHES. Mr. Harrell stated that most old 104 contracts do not provide for a raise in price under deregulation. And this was true, generally, when the contracts were written; but during the period of the early seventies, when the interstates were unable to compete with the intrastates and were competing mostly in the offshore area where the intrastates were excluded, it was quite prominent for the interstate pipelines to offer NGPA tracking or a deregulation provision in these old contracts, in exchange for a producer dedicating especially gas in the offshore area to that pipeline, rather than some other pipeline.

So the result is that many of these 104 contracts do at least have an FPC tracking clause which is, as a matter of fact, defined in S-615 to be the gas cap.

In other words, if you had an FPC tracking, as I understand the bill, he can go up to the gas cap.

Further, intrastate contracts, that were entered into before the NGPA primarily do not have the market-out provision. We didn't think that they were necessary. Once the NGPA passed and we had the dual conditions of deregulating deep gas and deregulating other gas, we, immediately upon passage of the NGPA, began putting market-out clauses in our contracts, with no objection from the producers.

However, there was a period of time from the passage of the NGPA until about late 1980, perhaps 1981, for some pipelines, when they did not put a market-out clause in either of their 107 contracts or in the deregulation provision of their NGPA regulated contracts.

So the flyup danger is real, if something is not done to either defuse those clauses or permit cancellation of the contract, the flyup is a definite possibility; a probability.

[The prepared statement of Mr. Hughes follows:]

HEARINGS ON

PENDING NATURAL GAS LEGISLATION

STATEMENT OF CHARLES F. HUGHES, JR.
VICE PRESIDENT - GAS SUPPLY,
OKLAHOMA NATURAL GAS COMPANY

March 28, 1983

I. Introduction

Mr. Chairman and Members of the Committee:

I am Charles F. Hughes, Jr., Vice President of Gas Supply for Oklahoma Natural Gas Company ("ONG"). I appreciate this opportunity to appear before you today on behalf of ONG to discuss the current problems in the natural gas market, and I am hopeful that ONG's views will aid the Committee in its consideration of pending legislative proposals, particularly the Administration's bill (S. 615), aimed at rectifying the market distortions in our industry and restoring the vitality of this important segment of the nation's energy supply system. We at ONG are encouraged by the Administration's proposal and give special praise to Secretary of Energy Hodel for crafting a comprehensive bill which we believe, with certain modifications, holds forth the prospect of real decreases in average natural gas prices, restoration of lost industrial sales load and the emergence of a free and orderly market in our industry. Through this process, we believe that substantial economic benefits can and will be realized by consumers and all sectors of the natural gas production and marketing industry alike.

Before turning to a discussion of the Administration's bill and other legislative proposals, I would like first to provide a brief sketch of ONG and its operations and then review with you the problems that have resulted from governmental price regulation in our industry. I believe this discussion will help the Committee in gaining a better understanding of the type of legislative action that is needed to bring about enduring and beneficial change in the natural gas market.

II. Background on ONG

ONG is an intrastate pipeline company that operates over 15,000 miles of transmission and distribution facilities covering much of the State of Oklahoma. It is the largest intrastate seller of natural gas in Oklahoma, with sales of almost 280 Bcf of gas in 1982 and sales in 1980 and 1981 of 356 Bcf and 342 Bcf, respectively. ONG obtains its entire supply of gas from in-state sources, made up of approximately one-third from direct wellhead purchases, one-third from purchases at the tailgate of gas processing plants and one-third from purchases from other intrastate pipelines.

It sells gas to a wide assortment of customers, including residential and small commercial users, city gate customers who sell the gas through local distribution systems, industrial customers who use the gas as feedstock and boiler fuel, and pipeline customers who purchase the gas pursuant to Section 311(b) of the Natural Gas Policy Act of 1978 ("NGPA") and transport it outside the state for resale in other market areas. All of ONG's sales for consumption within Oklahoma are subject to rate regulation by the State Corporation Commission. During 1982, ONG's weighted average sales rate was \$3.28 per Mcf, and its weighted average cost of gas was \$2.72 per Mcf. This relatively low average cost of gas in relation to intrastate pipelines in other states has been achieved by ONG's continued awareness of its price-sensitive markets and because of passage of the Oklahoma Natural Gas Price Protection Act by the Oklahoma Legislature, which limited the severe price escalation which would otherwise have been caused in old gas contracts by the NGPA.

III. Wellhead Price Regulation -- A Failed Experiment

A. Creation of a Shortage Under the Natural Gas Act

Prior to enactment of the NGPA, ONG was not exposed first hand to federal price controls on wellhead sales of natural gas. Instead, its only exposure was as an observer of the near disaster created in the interstate market as a result of producer price regulation under the Natural Gas Act. Because prices in the interstate market were held at artificially low levels, there was insufficient investment in the exploration and development of new interstate supplies. As a result, interstate pipelines were not able to replenish their reserves nor maintain deliverability and therefore experienced severe shortages and massive curtailments during the 1970s.

During this period of interstate price regulation, however, there was no regulation of wellhead sales in the intrastate market, and ONG and other intrastate purchasers bid freely for new supplies. Because interstate buyers were limited in the available gas they could purchase by the effects of Natural Gas Act price controls, ONG was able to bargain for all the gas it needed, and when it had deliverability in excess of the demand of its customers, it was able to sell the excess gas on a temporary basis to interstate pipelines. As a result, ONG was able to balance its supply with the demand of its customers, maintain reserves for its customers' future needs, and purchase gas at wellhead prices that remained relatively stable at reasonable levels.

As conditions in the interstate market reached crisis proportions in the mid-1970s, culminated by the shutdown of schools and factories during the winter of 1976-1977, Congress was prompted to take action to address the issue of wellhead price controls. The result was the NGPA, the product of over one and a half years of heated debate and tortuous compromise.

The purpose of this legislation was to bring a fresh infusion of gas into the interstate market by providing incentive prices for the development of new supplies and by creation of a national natural gas market. The legislation was also designed to serve as a transition mechanism to the eventual deregulation of natural gas prices and, in so doing, established some 28 different wellhead pricing categories. As part of the bargain, wellhead price controls were extended to the intrastate market, and old interstate gas was made forever subject to federal price ceilings and non-price regulation under the Natural Gas Act.

B. Dysfunction of the Price Mechanism Under the NGPA

While the NGPA brought relief to one problem--the shortage in the interstate market--it has created a new set of problems of equally grave or more serious magnitude. Because of the enormous supply deficiency that evolved in the interstate market during the 1970s, there was a tremendous release of pent-up demand for gas upon the NGPA's taking effect. A seller's market immediately predominated, and NGPA price ceilings with their built-in inflation adjustment factors became price floors. In addition, producers were in a position to demand and obtain extremely high take-or-pay requirements in their contracts to maximize cash flow and price escalator clauses to assure them maximum protection against future inflationary trends.

Furthermore, a large segment of the production industry directed the major part of its exploration and development effort toward the production of "high-cost gas" subject to Section 107 of the NGPA. These producers were able to command prices for Section 107 supplies far above the levels that would obtain in a free market because of the effect of rolled-in pricing by pipelines, particularly interstate pipelines with "cushions" of cheaply priced NGPA Section 104 gas. The development of this Section 107 gas--in some producing regions, the only game in town for the purchaser in need of supply--only further accelerated the upward momentum of natural gas prices. As these patterns evolved, there was also unparalleled inflation in the energy sector, serving only to reinforce the expectation institutionalized in the NGPA that gas would continue to be in short supply and prices would continue to escalate.

The "market forecasting" implicit in the NGPA, however, has not proved accurate. Supplies of natural gas have now exceeded demand, in large part because of a drop in energy consumption patterns due to the current economic recession and conservation efforts by all energy consumers. Moreover, in contrast to the extreme inflation in the energy sector of the 1979 through 1981 period, prices of competing fuels are now falling, and gas is experiencing loss of substantial industrial load to these fuels, particularly residual fuel oil. As natural gas sales load declines, the cost of maintaining the transmission and distribution system must be spread over a smaller number of sales units, thereby placing added pressure on marginal, price-sensitive industrial customers to discontinue the use of gas because cheaper alternate fuels are available or because high energy costs make continued operations uneconomic.

Under classic economic theory, in a properly functioning market price serves as the mechanism to bring supply and demand into balance. Thus, when supply exceeds demand, prices will fall to stimulate demand and retain market share. In the natural gas industry, however, the price mechanism simply is not working because of the effects of governmental regulation on wellhead sales and the conduct that such regulation has fostered.

NGPA prices with their constant upward trending and the contract patterns the NGPA engendered in the seller's market immediately following its enactment have combined forces to produce a regime of wellhead prices that is virtually impervious to the economic realities of the market. Prices are locked-in on an upward path with little or no ability to moderate or adjust downward to bring supply and demand into balance. This pricing structure has given birth to the anomaly of falling demand yet increasing prices that now exists in the natural gas market. To an extent, this phenomenon is only exacerbated by high take-or-pay requirements in gas purchase contracts, which tend to insulate producers from signals that prices have exceeded market clearing levels.

Unless substantial adjustments can be made in the wellhead pricing structure to bring prices back into line with current economic realities, the natural gas industry faces disastrous consequences which could cripple the industry itself and severely disrupt efforts to achieve a nationwide economic recovery. The problem confronting the industry is its capacity to regain and maintain its share of industrial sales load, which historically has accounted for over 50 percent of the sales of natural gas nationwide. This component of natural gas load is extremely price sensitive because of competitive forces affecting the economics of continued business operations and because of the ability of a large segment of industrial users to burn fuels other than natural gas. If gas prices continue to rise and do not respond to the needs of these customers, much of the industrial sales load could be lost. The result will be a tremendous shifting of transmission and distribution costs to the remaining sales base. This in turn will fuel a surge in inflation, result in even higher prices for residential and small commercial customers remaining on the gas system, and produce significant economic dislocation as a result of shutdown of industrial facilities that can no longer remain in operation.

C. ONG's Experience Under the NGPA

As ONG has witnessed the events that have unfolded since enactment of the NGPA, it has become increasingly concerned about the future vitality of the natural gas industry and its ability to re-establish an orderly market in the existing regulatory environment. During the past four and a half years since the NGPA was passed, ONG has exerted its full efforts to keep its gas costs down while still maintaining an adequate reserve position for its customers' future needs, and it has succeeded in holding its weighted average cost of gas at levels significantly below national averages for pipelines. Yet, even with these efforts, ONG has experienced load loss and the accompanying shifting of costs to a smaller sales base.

The load loss on ONG's system has occurred in several ways. First, conservation efforts and the effects of the current economic recession have produced a sizeable drop in demand. Load loss due to conservation measures is probably permanent, since customers are unlikely to abandon conservation practices even if gas prices come down. The principal load that ONG has lost through the effects of the recession is service to petroleum refinery customers, who are unlikely to resume operations until demand for petroleum products picks up as the economic recovery gains momentum. But even then, refinery load will not come back if gas prices are too high to permit refining operations to be economic.

During the past several years, ONG has also seen a substantial decline in its NGPA Section 311(b) off-system sales to interstate pipelines. Between 1981 and 1982, these sales fell from 65 Bcf to 16 Bcf of gas. While some decline in Section 311(b) sales was expected as interstate pipelines rebuilt their reserve positions following enactment of the NGPA, the dramatic decline that has occurred in recent years is primarily demand-based. It reflects the effects of the recession in other areas of the country served by ONG's interstate purhasers and the loss of load that such purchasers have themselves experienced as a result of the inability of natural gas to retain its market share in the face of competition from other fuels, particularly residual fuel oil. To an extent, the inability of natural gas to compete in some of these interstate markets has been exacerbated by the high prices interstate pipelines have been required to pay for imported supplies of Canadian gas and LNG. Unless overall gas prices can adjust to market conditions, ONG's interstate customers will continue to experience load loss and therefore will be unable to sell their primary supplies, much less incremental supplies of gas provided by ONG.

Finally, apart from the decline in demand in ONG's refinery sales and in its Section 311(b) sales to interstate pipelines, ONG faces a potential crisis in connection with service to the largest segment of its Oklahoma industrial market--i.e., fertilizer manufacturing plants. These plants account for approximately 30 percent of ONG's sales in Oklahoma and are dependent upon natural gas for use as a feedstock in the production of ammonia. Because of depressed demand by farmers for fertilizer and competition presented by cheap imported supplies of ammonia produced in countries such as Mexico and the U.S.S.R. which have maintained natural gas feedstock prices at artificially low levels, the Oklahoma fertilizer plants are in a marginal operating condition and are extremely price-sensitive. If gas prices do not moderate, it is very likely that these plants will be forced to curtail or shut down operations, as have many such plants on other pipeline systems that have higher gas costs. The loss of this substantial load from ONG's system could cause a drastic shift in costs to ONG's remaining customers and lead to sizeable reductions in ONG's takes of gas from Oklahoma producers.

IV. Need for Legislation

From the foregoing discussion, I am hopeful that the Committee has gained an insight into the nature of the problems affecting the gas industry and the unfortunate consequences that could be felt by all sectors of the economy if a market-oriented pricing structure is not established for wellhead sales of natural gas. The current scheme of price regulation and the contracts between pipelines and producers keyed to such regulation have formed a Gordion Knot that has effectively prevented the pricing mechanism from functioning to balance supply with demand. The continual rise of natural gas prices in the face of falling demand portends a terrific loss of industrial sales load by our industry, which could cause huge increases in the rates to remaining customers--principally residential and small commercial users--as they are forced to carry the entire costs of the transmission and distribution system.

While it is ultimately in the best interests of both producers and pipelines that sales volumes of natural gas be maximized and that gas remain a competitive, reasonably priced source of energy, the current legal relationships that bind these parties make attainment of this objective almost impossible in the foreseeable future unless Congress acts. Contract renegotiations are being attempted on an ongoing basis by virtually all pipelines, but producers are hesitant to give up any current economic advantage without some assurance that the same concessions are being made industry-wide. Out of economic self-interest, no producer wants to "throw the party" alone, and virtually all producers fear potential liability to royalty owners, drilling fund partners and bankers if they cut prices and other producers do not. As a result, there is tremendous inertia impeding wholesale renegotiation of contracts, and even if renegotiation were to occur, it is unlikely that it would happen soon enough to avert substantial loss of sales load.

Because voluntary renegotiation of contract prices industry-wide does not seem probable at this time and because immediate price relief is needed to restore order to the market, ONG believes that legislative intervention is required to initiate the process of adjusting relationships between producers and pipelines to reflect current economic realities. Such intervention, however, should be limited in nature and should have as its goal the eventual lifting of all federal price and non-price regulation on wellhead sales and the establishment of a free and open market in natural gas.

In seeking to achieve these objectives, ONG believes that legislation should meet the following criteria: (1) provide a mechanism for an immediate reduction of wellhead natural gas prices in line with market-clearing levels; (2) provide a mechanism to allow pipelines to adjust their contractual relationships with producers to take into account market forces in the transition to decontrol; and (3) remove artificial restraints on the use of natural gas and on access to natural gas in different markets. With these criteria in mind, ONG finds that the Administration's bill provides the most workable framework for legislative action. With certain refinements that I will discuss below, we believe that the bill should be reported favorably by the Committee and approved by the Senate.

V. The Administration's Bill (S. 615)

Philosophically, we are in agreement with the Administration's approach that legislation dealing with wellhead prices of natural gas should be market-oriented and not designed either to reinforce or perpetuate an already-failed regulatory regime. For this reason, we applaud the Administration's efforts and reject as unsound bills that would impose price freezes or otherwise attempt to address the industry's problems through more regulation. Thirty years' experience with price controls should teach us that government regulation is a poor manager of the market. Prices set by market participants through free negotiation--not by reference to governmental prescriptions--should be the mechanism for bringing supply and demand into balance. Recent events regarding decontrol of oil prices and the price movements in that commodity show that a price structure unencumbered by governmental regulation can adjust to the signals of the market place and move downward when supply exceeds demand.

A. Mechanism to Achieve Immediate Reduction in Price

Of critical importance to the restoration and maintenance of the gas markets is that a legislative solution provide tools for achieving an immediate reduction in price in order that further industrial sales loss may be averted and load that has already been lost will once again find natural gas an economically attractive fuel. The Administration's bill provides such tools in several different ways: (1) through a gas price cap to be effective until total decontrol of all wellhead prices (Secs. 301, 201, 304); (2) through a take-or-pay reduction option for pipelines in connection with existing contracts (Sec. 315); and (3) through a purchase gas cost ("PGA") passthrough limitation on interstate pipelines (Sec. 101). ONG believes that, with certain modifications, these provisions can operate effectively to achieve the desired result of price reduction in a fair and equitable way.

1. Gas Price Cap

The purpose of the gas price cap is to effectuate a rollback in NGPA prices that have exceeded market clearing levels and provide a transition mechanism in the price structure to maintain stability of prices during the period preceding total decontrol. In this latter respect, the cap limits prices for gas subject to NGPA pricing categories that are decontrolled in January 1985 (Sec. 201(c)) and tempers price adjustments pursuant to the operation of price escalation clauses in existing contracts (Sec. 318). The standard for determination of the cap is market-based; it is not some extraneous index that only by coincidence reflects market clearing prices for natural gas. ONG endorses this approach and suggests three refinements for improving the cap so as to make it a better index of true market levels.

First, as presently structured, the cap is based on prices in both new contracts for natural gas and contracts that are renegotiated after enactment of the legislation. ONG believes that the cap should be based only on prices in new contracts. Because of the differing bargaining positions and objectives of parties already bound in contractual relationships, inclusion of renegotiated contracts in the cap is not likely to provide a reliable indication of the market. For sound economic reasons, some renegotiated contracts will have prices that are substantially lower than current market clearing levels, while others will have prices that are higher.

For example, if S. 615 is enacted, gas purchase contracts could be renegotiated under threat of cancellation. The prices that result from some of these renegotiations, however, may be higher than prices under new contracts because higher prices are needed to keep the reserves on stream and prevent discontinuance of producers' operations. In addition, prices established through exercise of market out provisions in existing contracts should not be considered "renegotiated prices" because market out provisions generally call for unilateral action by the pipeline purchaser. Notwithstanding this situation, however, some pipelines may view prices established through exercise of market outs as renegotiated prices to be included in the gas cap price. Yet, inclusion of either of the foregoing types of renegotiated prices in the cap would only create distortions. In the market-oriented environment the Administration's bill seeks to create, it is contemplated that the lowest cost supplies of gas will be developed first. As these new supplies are brought to market, the contract prices for their sale should be the reference point for the gas price cap.

A second suggested refinement for the price cap is that it should be based on prices in identifiable producing areas rather than on national averages. Adherence to this regional approach will heighten the market sensitivity of the cap, eliminate uncertainty that could impede pipelines in their gas acquisition and sales planning efforts, and result in prices that reflect true conditions in the applicable producing regions.

Because of different transportation costs and differing economic and competitive forces at work in different markets, gas prices vary from region to region. For example, prices in new contracts for gas produced and sold in California or Michigan, where the cost of transporting the gas to market is low, could be quite different from prices paid under new contracts in the Gulf Coast Area for gas that is to be sold in those same California and Michigan markets. This is because the cost of transporting the Gulf Coast gas to more distant markets is much higher. Given such differences, it is ONG's perception that use of nationwide prices in the gas price cap could operate to increase overall prices nationally. Use of regional prices, however, will serve to eliminate this problem.

Taking into account the discrepancies that exist in prices in different producing regions throughout the country, ONG would suggest that the cap be based either on statewide prices in new contracts or prices in new contracts in the old FPC rate areas. Either of these standards will serve to make the cap more reflective of conditions in the region where the gas is actually produced and sold to pipelines.

ONG's final suggested refinement to the gas price cap is that the cap be based on weighted average prices for gas actually taken rather than on estimated prices and volumes. Because of market out clauses, possible severe disruptions in the market, and other anomalies, estimates could be very distorted, especially on a weighted average basis.

2. Take-or-Pay Reduction Option

A second feature of the Administration's bill aimed at achieving immediate reduction in price is the take-or-pay reduction option in favor of pipelines. (Sec. 302.) This provision allows pipelines to reduce take requirements under existing contracts on an NGPA category-by-category basis down to 70 percent of deliverability. The provision also affords the producer the option to market the excess gas elsewhere in the event the pipeline exercises the statutory take-reduction right.

ONG believes that the take-reduction provision will be a useful tool in achieving overall price decreases and in encouraging renegotiation of contracts to reflect current market conditions. It would offer one suggestion for improvement, however, in order to eliminate uncertainty concerning the status of existing relationships.

A provision should be added to the take-or-pay reduction option to require that existing purchasers be reimbursed for funds already paid to producers for gas that has not been taken in instances where the producer markets the excess deliverability elsewhere. Few if any existing contracts contemplate take-or-pay reduction options of the type in the Administration's bill. Therefore they provide no mechanism for restitution of take-or-pay deficiency payments in money or in kind. Furthermore, if the producer sells the volumes in excess of 70 percent of deliverability to another purchaser, the means for making-up past prepayments in kind are eliminated. With these considerations in mind, ONG would suggest that take-or-pay deficiency payments be reimbursed directly out of a percentage (e.g., 20 to 25 percent) of the monthly payments made by the new purchaser of the gas until full restitution has been made. It is contemplated that ratepayers of pipelines would receive appropriate adjustments in rates as reimbursements of take-or-pay deficiency payments are returned.

3. PGA Passthrough Limitation

ONG urges the Committee to give careful consideration to the views of companies that would be subject to the PGA passthrough limitation and to scrutinize the workability of such limitation in its resent form. This type of enforcement tool must not operate in a way that will impede pipelines from making reasonable business judgments or starve them for cash flow while their judgments are being reviewed in a regulatory proceeding.

B. Mechanism to Allow Pipelines and Producers to Adjust Relationships in the Transition to Decontrol

A second criterion for legislative action is that the legislation provide a mechanism for pipelines and producers to adjust their contractual relations to take into account market forces during the transition to decontrol. The Administration bill addresses this concern by providing tools to encourage renegotiation of contracts. The principal device for bringing about contract renegotiation is the "market out" provision in Section 303 (new NGPA § 316). This provision gives both wellhead sellers and purchasers an option to cancel any existing contract during 1985. In the event a contract is cancelled and the seller finds another purchaser for the gas, the original purchaser is required to provide transportation of the gas at an incentive rate subject to availability of capacity.

ONG agrees with the concept of a "market out" provision and believes that such a provision is needed to give purchasers under existing contracts sufficient leverage to induce renegotiation of contracts with producers to reflect current market conditions. By nature, a market out provision is structured to allow a purchaser of gas, who bears the risk of finding a market, to attempt to negotiate the price in a contract downward in the event the currently effective price is too high for the gas to be marketed. Typically, if the purchaser and seller cannot come to terms on new contract provisions, and the seller is able to find a buyer elsewhere, the contract may be terminated.

The Administration's bill does not incorporate the concept of a true market out, but instead provides a unilateral right of termination in favor of either purchaser or seller. This approach is not justified by the circumstances confronting the natural gas industry at this time. Nor does it constitute wise policy because of the market disruption--not market order--it will engender. If producers are allowed unilaterally to cancel older, low-priced contracts, natural gas prices will increase substantially because of pipelines' need to retain reserves in order to provide sufficient deliverability. The upward renegotiation of these low-priced contracts will, in turn, threaten the industry with sizeable and sudden loss of sales load to price-sensitive customers. In order to counteract these effects, pipelines will then be required to exercise market outs on newer, high priced contracts to bring the prices under these contracts down and reduce prices for new gas. Consequently, producers under newer contracts with higher cost production will see their operating margins squeezed substantially. In addition, the reduced prices for new gas will lessen the incentives to explore for and develop new reserves.

Although ONG supports the concept of decontrol of pre-NGPA contracts when the original terms of such contracts expire, it believes that creation of a disruptive environment--as would most likely result under the Administration's producer termination right--is neither desired by the Administration nor by the industry. Accordingly, ONG urges that the "market out" provision in Section 303 be modified to conform to the pattern of a true "market out." Under the provision as so modified, the market out would be exercisable by the purchaser only. However, if the purchaser and seller cannot agree on new contract terms, and the seller is able to find another buyer for the gas, the contract could be terminated and the purchaser would be required to transport the gas on the seller's behalf.

In addition, the legislation's market out provision should address reimbursement of prepayments made under take-or-pay provisions in existing contracts where such contracts are cancelled for failure of the purchaser and seller to agree on new terms. Since most existing contracts do not address reimbursement of take-or-pay prepayments in the context of contract termination as a result of a statutory market out, ONG believes that the procedure described above for reimbursement under the take-or-pay reduction option should be applied.

In the event a purchaser cancels a contract under the Administration's proposal, the purchaser should not be required to transport the gas to one of its own customers.

Great expense has been incurred to install pipeline facilities and acquire reserves to serve these customers. Disruption of those relationships would jeopardize the entire pipeline industry. Therefore, mandatory transportation (subject to certain conditions) must be limited to transportation to another pipeline company or local distribution company that is contractually able and willing to purchase the gas.

C. Removal of Artificial Barriers on Gas Use and on Access to Gas Supplies

Consistent with its free market orientation, the Administration bill also strips away governmental reaulation that has impeded the use of natural gas by industrial users and other major fuel burning installations and has stifled access to gas supplies by intrastate pipelines. In dispensing with these restraints, the bill provides for (1) elimination of non-price regulation on old interstate gas under the Natural Gas Act and NGPA (Secs. 202, 302); (2) liberalization of transportation and sales arrangements that are exempt from jurisdiction under the Natural Gas Act (Secs. 401, 402); (3) contract carrier authorization with respect to certain transportation by interstate pipelines (Sec. 403); (4) repeal of Fuel Use Act restrictions on the use of natural gas in electric power plants and large industrial boilers (Sec. 501); and (5) repeal of incremental pricing under the NGPA (Sec. 503).

With certain reservations, ONG endorses these changes in the regulatory structure and believes they will assist in the expansion of natural gas demand, development of additional supplies, efficient use of transportation capacity and enhancement of competition. In assessing these changes, ONG notes that contract carrier status has been applied to interstate pipelines but not to intrastate pipelines, presumably because such regulatory changes can best be effectuated by state legislatures or state utility commissions. However, if contract carriage is made applicable to intrastate pipelines through federal legislation, ONG believes that administration of such transportation should be left to the appropriate state regulatory body which is familiar with the pipeline's operations--not the FERC, which has no experience in regulating intrastate pipelines. Also, such transportation should be limited to the delivery of gas to another pipeline company or local distribution company contractually able and willing to purchase the gas.

VI. Other Legislation

In contrast to the free market approach of the Administration's bill, other natural gas bills under consideration by the Committee generally propose a "freeze" on natural gas prices as of a prior date and/or further regulation of producer-pipeline transactions. ONG opposes these bills for a number of reasons.

Philosophically, we believe in the market-oriented approach provided by the deregulation provisions in the Administration's bill. This philosophy is based on practical experience. We have learned the hard way that government regulation under the Natural Gas Act designed to keep wellhead prices down resulted in a shortage, and that government regulation under the NGPA designed to promote adequate gas supplies led to an unrealistic pricing structure. The solution is not a stopgap "band aid" program of further government regulation. Such a solution is likely to come too late or extend for too long and result in unanticipated side-effects requiring yet another governmental "fix."

A second, related problem with the other Senate bills is that they address some of the symptoms of disorder in the natural gas market without curing the fundamental ill. Freezing natural gas prices at 1982 levels, for instance, will not answer the need for pipelines and producers to enter into gas purchase contracts that can respond to market forces. Voiding or limiting escalator provisions or take-or-pay clauses addresses this problem only superficially. More government regulation does not answer the problem at all. In contrast, a market out provision available to pipelines and deregulation as provided in the Administration's proposal will come to grips with the real problem in an effective way.

A third problem with some of the other Senate proposals is that they do not give equal treatment to intrastate pipelines. For example, S. 689, introduced by Senator Heinz, contains a provision for market out rights that do not extend to certain intrastate contracts. We strongly believe that intrastate and interstate pipelines should be accorded equal treatment on market outs.

VII. Conclusion

As I have outlined above, there is a serious problem in the natural gas market as a result of governmental regulation under the NGPA. Natural gas is fast becoming an unattractive source of energy in this country because of a pricing structure that is locked-in to continuous upward movement with no ability to adjust downward to bring supply and demand into balance. Unless this dysfunction in price can be corrected, the industry faces potential collapse. As natural gas continues to lose market share, consumers' prices will continue to rise creating unnecessary economic hardship and dislocation.

Because the problem does not appear capable of solution by itself due to the contractual arrangements that have reinforced NGPA prices, legislation is needed. ONG believes that the Administration's bill provides the best framework for proceeding with this task. If this bill is enacted with the modifications we have suggested, there is real hope that an orderly and efficient market can be restored in the natural gas industry and that adequate supplies of natural gas can be made available at reasonable prices.

I thank you for the opportunity to appear before you today and I would be happy to answer any questions you may have.

Senator NICKLES. Thank you both very much.

I have a whole specter of questions. I might start with Mr. Haney.

You mentioned representing the fertilizer manufacturers, that you were probably the largest user of natural gas outside of the utilities in the State.

Mr. HANEY. The electric utilities.

Senator NICKLES. The fact that you mentioned that you are representing the fertilizer manufacturers—and we have several large ones in Oklahoma—that use a great deal of natural gas, I believe I heard in your statement that 85 percent of the costs of their product, fertilizer, is borne from natural gas; is that correct?

Mr. HANEY. That's an approximate number, based on the efficiency of the plant. But that's a good one.

Senator NICKLES. A great percentage, or the majority, by far the majority of the cost of fertilizer is the cost of the natural gas at least in the plants in the United States.

Mr. HANEY. That's true.

Senator NICKLES. So you have a very, very strong interest in what the cost of gas would be, and yet, in spite of that, as the general thrust of your statement, I believe, reads, OFMA does favor decontrol of natural gas?

Mr. HANEY. That's true.

Senator NICKLES. And you have some reservations about some of the proposed mechanism in the administration's bill, OFMA does not endorse that exactly per se, as it is; but you did hope that the country would move as rapidly as possible toward deregulation?

Mr. HANEY. That's true, Senator.

We feel that as S. 615 is the best vehicle we have seen so far to accomplish that.

Senator NICKLES. So you have a very strong, and very vested interest in seeing that gas prices be competitive, and also as low as possible in the short term, as well as in the long term; because, if not, you are going to be out of business.

Mr. HANEY. We have some testimony before the Oklahoma Corporation Commission to give us both of those numbers as to price. We can stand a somewhat higher price in the short term. But that means we are not recovering any capital costs, making any profit whatsoever; but just surviving.

For the industry to survive in Oklahoma, it will have to be somewhat lower than that number. Obviously, at some time we must catch up with our maintenance, and we must have capital to continue on with business.

Senator NICKLES. Isn't there currently a couple of fertilizer plants in the State of Oklahoma that are down now? Is that due to the demand or the high cost of gas?

Mr. HANEY. Both.

We have operated for well over a year on that verge; and some of us have been down for some time and come up again. It's been a real month-to-month living for all of us. So in any one month some of us are down and some of us aren't. It depends on the market, on the cost of gas and so forth.

Senator NICKLES. How much of an impact have you felt, an adverse impact have you felt, due to Mexican imports, either of gas or Mexican imports of finished product in fertilizer?

Mr. HANEY. It's been a substantial effect. More than one Oklahoma manufacturer has imported foreign ammonia when it become economically viable to do so.

The situation, as I see it, is it isn't getting any better.

Senator NICKLES. You mentioned one company was importing ammonia from Mexico.

Mr. HANEY. I would say more than one.

Senator NICKLES. More than one?

Mr. HANEY. Yes.

Senator NICKLES. Are you aware of the fact that when we buy natural gas from Mexico and we are paying, I think, in the $4.90 range, that——

Mr. HANEY. Absolutely.

Senator NICKLES [continuing]. We are paying the Mexican Government in the neighborhod of—I think we tried to figure up how much of it was a tax, and I don't have the figure, but of a substantial amount of that is going not to, the producers, but a substantial subsidy to the Mexican Government?

Mr. HANEY. That's true.

We have pointed out to anyone who would take the time to listen to us, Senator, that with 85 percent of the cost of a ton of ammonia being natural gas, that the gas coming in from foreign sources, the gas is valued at on the order of 50 cents, some a little less, some a little more; but in that neighborhood.

It's hard to—for many people to realize that 1 ton of ammonia is not just 1 ton of ammonia. 85 percent of it is natural gas.

Senator NICKLES. You are a large industrial consumer of gas, an end user of natural gas. What do you think the impact would be of this bill on your final cost of natural gas, this bill or something similar?

Mr. HANEY. We feel that eventually the American economy must get back to a market-clearing economy or a free economy, whatever the term is.

Until it does so, we will be in trouble. But once it does, our industry, at least, can compete on an equal basis with anyone in the world.

They are using our technology, and, frankly, Senator, we are better at it than they are. Their plants are duplicates of ours. Given equal natural gas prices, we will far and away beat them.

But the wide disparity in natural gas prices now between us and others is making us nonviable.

Senator NICKLES. You are willing to—I started to say, you know, there will be some that will testify—possibly some this morning—that will testify that deregulation will greatly increase the cost, both to residential and also to industrial consumers. But, by your statement—and you have a very large investment. I don't know—how much gas did you say was consumed by the companies that you are representing today?

Mr. HANEY. 90 billion cubic feet a year.

Senator NICKLES. 90 billion cubic feet per year.

Mr. HANEY. Our industry consumes slightly more than half of what the entire State of Kentucky, for instance, would use. We are a very large user.

And I might point out, that's a customer of the Oklahoma gas industry. And it's a year-round, steady customer, under normal times, with a continual funnel of funds into the Oklahoma economy. It is not just a wintertime type.

Senator NICKLES. So you have looked at this issue with a great deal of care, because it's such a tremendous cost; and, yet, you still feel quite confident in the long run that this is going to be a benefit to your industry and also to the farmers and others that you are supplying that product. You feel like you would be more competitive with the controls than without?

Mr. HANEY. Yes, we do.

An instance is in the last 3 months our costs have risen over 8 percent, in a time when there is a glut on the market. And that's not realistic.

Senator NICKLES. Do you have a figure of the average gas cost that the group that you are representing—I realize it would probably vary substantially, but on a thousand cubic feet——

Mr. HANEY. I believe maybe Charlie can answer that better than I. I represent one plant, even though I am chairman of OFMA. And it depends——

Senator NICKLES. Could you give us what your plant's average gas cost might be, just—I am just looking for a——

Mr. HANEY. This month it's approaching $3.50.

Senator NICKLES. The provisions in the bill that would provide—if the contract was opted out, would direct negotiation with producers, although presently you mentioned the contract carriage provisions would not apply to intrastates. But if they did apply ot intrastates, or if you did have a pipeline connection that would enable you to directly negotiate with producers in an area, do you think that would possibly put some additional pressure on the carriers, on the pipelines, to enable you to get a better price?

In other words, where you might be able to go out and shop for gas on your own?

Mr. HANEY. There are many technical problems associated with that. This has, of course, been brought up. We all do have contracts with ONG and probably Charlie would object to that, but, in any event, I am not a lawyer; and there are those clauses in those contracts that you have to deal with.

There is also a technical problem of long-term supplies of a large amount. For instance, our plant uses 87 million cubic feet day. And that has to be on a steady pressure, and so forth. So, while you can gather up 87 million cubic feet a day, it might not be possible to deliver it at one time.

So there are many problems associated with that. In general, it sounds good for the future, but next week, I don't believe it will work.

Senator NICKLES. Probably not.

Mr. Hughes, would you support or give your comments on extension of the passthrough provisions and contract-carrier provisions to intrastate pipelines?

Mr. HUGHES. You said passthrough, do you mean passthrough as far as hauling?

Senator NICKLES. The passthrough provisions, the limitations, in the administration's bill, they had some limitations on the amount of costs that could be passed through, kind of regulation of the price at the end of the line, that would apply to interstate pipelines; they wouldn't apply to intrastate pipelines, as presently drafted.

Have you considered what would happen if that was potentially applied to the intrastate pipelines, as well?

Mr. HUGHES. If it were applied to the intrastate pipelines. I would certainly prefer and hope that it would be administered by the local commission in each State where the intrastate pipeline is. Given the rules, whatever they may be—and I think you would admit that the language in the passthrough now, prudency or whatever the key word is, is not exactly spelled out as to what will happen when these passthroughs are reviewed.

Certainly, we would object to the passthrough restricting cash flow for the pipelines now affected by it, as well as, certainly, for us. In other words, if we have an undue delay, well, we pay the price to the producer under a legitimate renegotiated contract, and then we are not permitted to pass it through until some time later, and we don't get recovery of that which we didn't pass through, that could very quickly break any pipeline subject to that kind of a regulation. And, of course, we wouldn't want to be in that position.

Senator NICKLES. So you think possibly we need to do some work on the passthrough provisions that would apply to all pipelines; but for intrastate pipelines, you would prefer continuation under State regulation and not be under FERC's limitation on what you could passthrough automatically.

Mr. HUGHES. Yes, sir.

Senator NICKLES. There will be, as you are probably well aware of, some discussion or efforts by some to make that application apply equally to intrastates as well as to interstates.

Mr. HUGHES. Well, the only thing is that the interstates—I mean the FERC is not really that familiar with our method of operation, and they would have to expand their expertise and staff. I would think, to be able to do that; whereas, the local commission has jurisdiction here, not only over the distributing part of it, but the pipeline, the—they regulate the producers as well. So they are, in my opinion, a far better position to enforce whatever would be desired to be enforced.

Senator NICKLES. There has been a lot of discussion in Washington, D.C., about a dual market between the intras and the interstate markets. I have been one that said, yes, we had a dual market before, before NGPA, where we were deregulated. And in the intrastate markets, as compared to the interstate markets, and although we paid somewhat of a higher price, we also had adequate reserves, and we didn't have the shortages that were experienced by most of the country that was due to over-severe price limitations.

Would you agree with that?

And then, on that premise, now, is there still a dual market under NGPA today?

Are intrastates now at somewhat of a disadvantage in relationship to interstates, because of the fact that they had such large low-cost volumes that they are able to average and pay high prices for gas?

Mr. HUGHES. Yes, sir. The intrastates have been at a disadvantage.

As you well know, Oklahoma Natural has not been as disadvantaged as the intrastates in Texas and Louisiana, because our legislature passed a bill shortly after the passage of NGPA that limited the so-called fly-up of the old gas which was permitted to go to section 102 under the Natural Gas Policy Act, which was some 50, 75 cents more than what we were paying in the free market at the time. And the indelegislature limited that increase on those old contracts under the indefinite prices to the section 109 price, which happened to be about exactly where we were on the free market anyway.

So, as a result of this large bulk gas that in Texas and Louisiana, absent a similar State bill, has gone to the—the old gas has gone to 102, and so they are approximately, on the average, about $1 higher than the cost of gas than we are.

Senator NICKLES. And so, at least for, say, Texas and Louisiana, they find themselves not being able to compete with the interstate gas companies, possibly, for the 107.

Mr. HUGHES. Yes, sir.

That effect. And, of course, you—in other words, intrastate is old gas, if you had indefinite pricing provisions in it. And most of the contracts did. They went up higher than—much higher than the old gas for the interstate, because theirs was essentially frozen at whatever it was, plus inflation.

Then you also had the rollover contracts, which the rollover contracts is a contract that expired and renegotiated in the interstate market, was considerably less, like 60 or 70 cents is rolled over; whereas, the interstate rollover was something over $1, $1 plus inflation, probably $1.30, $1.40 now.

In addition to that, on the rollovers, the interstates were given right of first refusal. So no one could come in and take that away from them, and where we were not given that.

It hasn't been a big problem with us, because we haven't had very many contracts that rolled over in this period since NGPA.

Again, it was another unfairness that was created in the NGPA, supposedly to retroactively correct the unfairness, as you might characterize it, of the intrastates' ability to buy gas during the early seventies, but, of course, that wasn't our design. That just—we were just there, and we simply did what the market demanded that we do. And, yet, we got a lot of blame from the heavily populated areas served by the interstate pipelines for doing something that they conceived to be wrong, but I conceive only to be the logical thing that was right, that is, paying prices that were still less than the market clearing price.

And we did not have any shortages. We were able to serve them considerable volumes of gas in the 1976–77 winter. There probably would have been a greater disaster, had not the excess gas been available in the intrastate market at that time.

Senator NICKLES. But still under NGPA as it exists today, we still have somewhat of a dual market, where at least some of the intrastate companies or States are at a little bit of a disadvantage to the interstates. Do you think if we passed a bill where we eventually get to total deregulation that that dual market will disappear eventually?

Mr. HUGHES. I will have to agree with some of the critics on this issue, that for a given industry that can pay a cetrain price for gas, let's say the ammonia industry, for instance, obviously, we can pay a—given a certain clearing price for ammonia feedstock, and given that the gas is going to be produced in Texas or Oklahoma or Louisiana, I think it's obvious that we could afford to pay a higher price for the same plant gate delivered feedstock than, say, an interstate could pay in this same area. Then add the transportation, and they could not—they could not pay as high a price in the field, given that you've got a market clearing, feedstock price at the ammonia plant.

So, yes, certainly industrial loads, I think, the intrastates will always have a certain amount of advantage, because of that transportation differential.

Senator NICKLES. Yes.

Mr. HUGHES. After all, the gas industry started here, and it only went——

I did want to add that by the same token, there is not enough market nor enough potential market in the producing States to absorb all the gas that we are producing today or capable of producing. And so it's not that we are going to go out and take gas away from the interstates. We are simply going to have a different mix of load than they would; would be my perception.

Senator NICKLES. Kind of turn that around a little bit, though, hasn't there actually been cases where interstates, because they have large volumes of low-cost gas, been able to pay the higher amounts for the 107 and be able to out-bid, say, some of the intrastates, because they didn't have such a large cushion to be able to average?

Mr. HUGHES. Senator, that is the theory that everyone has been assuming was taking place. But it ignored the facts of the situation.

Really, the pipelines that have the large cushion of cheap gas were the older pipelines, the ones that were built in the thirties and before World War II. And they generally not only had a large cushion of gas, but they had a pretty good RP ratio, because those contracts, those old contracts, not only were cheap, but they also had very little take or pay requirement.

So they not only had cheap gas, but they had a good RP ratio, so they weren't the ones that went out and in the past, and went crazy, you might say, over—by altering contract terms.

So it turns out—and this is the EPA, American Gas Association confirmed this, that it was actually the younger pipelines, the pipelines that were constructed since World War II, that did not have a—not only did not have the low-cost gas, but they didn't have the RP ratio. And they were the ones that had to get out and buy gas at any price to get their reserves up, to get their—not only their customers off their backs, by not having long enough term supplies, but the lenders.

Senator NICKLES. Yes. A couple of questions. You do favor decontrol of old gas?

Mr. HUGHES. Yes, sir, when the contract expires.

Senator NICKLES. When the contract expires.

Do you feel we should not abrogate those contracts, the old contracts?

Mr. HUGHES. No, sir, I do not think we should abrogate the old contracts.

Senator NICKLES. All right. Do you feel like there should be an opportunity for one party to be able to opt out, as in the administration's proposal, on January 1, 1985; that the seller or the buyer, either one, could opt out in that window of a year?

Mr. HUGHES. No, sir. I think that only the producer—I mean the purchaser should be able to opt out.

This, in my esteem, in letting the producer opt out is not a quid pro quo. We are not talking about the same thing. When that producer drilled that gas, as some of our independent people have pointed out, that was the economic situation at the time they drilled, that they could drill for 15-cent gas.

Senator NICKLES. Let me ask you a further question, then. Do you favor abrogation of high-cost contracts?

Mr. HUGHES. Yes, sir. I think it's just—the—well, let's look at it this way. Let's look at it as a true quid pro quo.

First of all, I told you that we didn't have any problem getting market-out clauses in our contracts after NGPA. We didn't ask for it before that.

I think we would have been able to get them in our contracts before that, had we asked. But it's really more comparable to the traditional provision in a contract that says—no gas purchase contract that I know of ever says that a producer has to do something that's uneconomic. If he is not getting enough revenue to continue to operate his wells or drill new wells, he can quite. He can plug the wells.

All we are saying is that if we have to pay so much for this gas to cause, in effect, a Government fiat, and we can't sell it, then we ought to be able to get out, too. That's the guid pro quo. Not letting him cancel an OT contract, simply because he wants more money.

Senator NICKLES. There seems to be a little inequity, though, if you followed that all the way through.

If you have a whole spectrum of contracts, and we've heard some producers—now, I was interested, because I think one or two of them mentioned it might be in their economic benefit. They said they wanted to see those contracts run their course.

But, also, they were talking about the course of old contracts and new contracts.

You are saying that you would like to have the opportunity to be able to keep the old contracts; but you want to abrogate the expensive ones. That seems almost like it would be where you would be coming from is we want to abrogate the contracts where we made a mistake, but where producers or somebody else, if you made a mistake or if you are stuck with a bad contract, you can't opt out; but we want out, to opt out on the ones that were economically to our disadvantage; that doesn't seem quite equitable.

Mr. HUGHES. Well, there's nothing—we are not advocating that they can't get out of the contract when the contract expires.

Senator NICKLES. But you are advocating that you want to be able to get out of a high-cost contract before that contract expires.

Mr. HUGHES. That's true. Because we have a problem that we didn't realize we had. We made a mistake, along with everyone else, that those contracts would not market out.

What I am saying is we can be forced to lose money under those contracts, or forced to not be able to market it. And the real other side of the thing is the producer is never required to lose money. He can quite. He can plug his well.

Senator NICKLES. I don't know that it's all quite that one sided, because you do have some producers that lose money not by their own will, but by economic circumstances, the price of gas, et cetera, wasn't what they anticipated.

I have a little bit of a problem with the idea of saying, yes, we are going to abrogate some contracts, but we don't want to abrogate the ones that might be to our advantage.

You have a couple other points in your statement that I would like just to touch on a little bit more.

You mentioned calculating the gas cap. And in that respect, I think you mentioned, or, correct me if I am wrong, in the determination of the gas cap, it was in the manner which you wished that it would be determined would be for only new contracts, and it wouldn't be renegotiated old or renegotiated 107.

Mr. HUGHES. Yes, sir, that's true.

Mr. HANEY. Senator, just one brief comment on Charlie's comments.

On the high-cost gas, I think we must remember that somewhere there is a customer; and that the customer simply can not afford that. Then, certainly, ONG can't eat it.

So, therefore, it backs back down to the producer. And if there is no customer, by definition, then there is no market. And if there is no market, then ONG simply can't take it.

Senator NICKLES. That's true, Mr. Haney, with the possible exception—and, here, again, this is my opinion, I guess—that you have a pleasant situation under NGPA, and many pipelines have been purchasing gas well outside of market clearing conditions, knowing full well that that was the case, knowing that there was no market for that gas at $7, $8, $9; knowing there is no market for the LNG that I referenced earlier, at the $7.13; knowing that the only way that they could pay those prices was, really, through a subsidy of the low-cost gas and the averaging and the roll-overs, so there are some inequities in that the marketplace wasn't making those decisions; it was by use of the government rules that were arbitrary in defining a particular sector that would allow paying prices that the market would never clear in the first place.

And I think that's caused, you know, right now, under NGPA, we have 28 different price categories for natural gas that range anywhere from, you know, 20-some cents to $9 or so.

Let me ask you another question, Mr. Hughes. Have you found a willingness by producers in your negotiation, renegotiations, where you have found maybe some contracts that weren't able to clear, possibly the manufacturers of fertilizer couldn't pay that type of price for gas, and you have gone and said we can't afford that $5.50 or the $6; we need to be able to sell the gas to Agrico or to Farmland, they are not going to be able to—they can't pay any more than $3.50 or $4 for that gas; and so has that enabled you to be successful in renegotiation of take or pay contracts or other type of contracts?

Mr. HUGHES. Yes, sir. We think we are going to have some success in renegotiating take or pay requirements, and maybe other terms of the contract. But when you start talking about renegotiating a price, your—the producer gets nervous, because he's got obligations to his mineral owners of whom he is merely a lessee, and he has—in many of these cases where you have limited partnerships, and it's not just the independents that have limited partnerships. You may recall in the early seventies that Sun and Continental both formed public drilling funds. And, in fact, one of the areas where we have the most of these 107 wells that we, incidentally, did not deliver to buy, it was an old contract signed before the NGPA, that had a price—indefinite price escalation in it. And the wells that were drilled on this contract are simply the infill wells. They are drilled extra wells in the field. But, yet, they qualify as 107 because were spudded after the magic date of February 19, 1977.

So here we had some gas that we didn't really want, that is now costing us right at $10 a thousand cubic foot.

Senator NICKLES. You are still paying $10?

Mr. HUGHES. No; we are not taking it. We've got it shut in.

But we have people trying to force us to take it through action at the Oklahoma Corporation Commission. Hopefully, they will not be successful.

But what I am saying is, contract terms other than price, yes, I think the producers—and you have heard statements here that some of the big producers—they will negotiate on that, because they have no obligation. The royalty owner generally does not participate in take or pay payments. So they are flexible to act.

But when you get these public drilling funds and your mineral owner itself, everybody is reluctant to be the first one. And I think that's probably—needs legislation, that everybody needs to be treated fairly. But they will not.

If you go out there and simply litigate and negotiate, everyone is not going to be treated fairly. It's going to depend on how big they are or what kind of a deal that they make.

Senator NICKLES. You did quite a bit of work and had several comments on the gas cap. One was that only new contracts would be figured in the gas cap, so you are seeking to have the gas cap come in to be very close to market clearing level; is that your purpose?

Mr. HUGHES. Yes; I don't know where it's going to come in. I have, basically, some of the same problems that the independents on the previous panel have about the gas cap. I don't know where it's going to come in.

Obviously, we are projecting it's not going to—it can't be more than the NGPA fixed prices, at least our prices can't be.

But I can certainly understand their concern that even if it's done the way we want it done, that there is still a possibility that their prices may be cut drastically, at least for a short period of time.

Senator NICKLES. Which could possibly be beneficial to Oklahoma Natural in the short run, but you think it would be detrimental in the long run, if you cut the——

Mr. HUGHES. We don't want to beat any producer over the head. We have to live with them, just like they say they have to live with us. And we don't want to do anything that is not necessary to be done to help us clear the market.

In that regard, we see if the contract cancellation could be effective on date of enactment, we see no reason to have a gas cap. We will take care of the price.

But I can understand, and I think I know where that gas cap originated, is in the concern of the distributor, who perhaps don't trust their pipelines to get strong enough on their efforts to threaten to cancel contracts.

Here is another basic thing. Pipelines don't like to cancel contracts. They will go to any lengths to get legislation, some of them, to fix it so they can lower their prices without threatening to cancel the contract; because they don't want to lose gas supply, and we don't, either. But we recognize that we've got more than we need; and we are willing to give up that which we don't need to serve our customer as the market is under construction.

Senator **Nickles**. Do you think the contract carrier provisions, where if the contract was abrogated as the bill is presently written, the interstate carriers would be forced to carry that, should that be applied also to intrastate?

Mr. **Hughes**. We don't have any objection to it being applied to the intrastates, except we have objections to the way the whole thing was written; and that is in our summary and in our statement we say that the only required transportation should be that if I cancel a contract, I have to transport it to another pipeline company, or I have to transport it to another local distribution company.

But we do not want to transport to the point of our customers; nor do we want the interstates to be forced to carry one of their customers.

We would like to make these kinds of deals, where we serve customers on interstate pipelines. If they have a plant that, say, is shut down, and they are not going to get it back anyway, or, say, it's gone to oil; we have found that most of the interstates will work with us.

We haven't closed any of these deals, but we are getting very close to closing some, where they finally are waking up to the realization that they would better have some transportation rather than nothing.

And when the customers switch off of gas and go to oil, they don't get anything. And if we can get gas to them at a price delivered to the end use customer at less than the pipeline can deliver it for, there—those kinds of deals are going to be made, because there's something in it for everybody.

But I don't like to have it made mandatory, because we can't anticipate all of the conditions that we might have—all the negotiations that might involve doing that.

Senator **Nickles**. So you wouldn't mind—you wouldn't mind as an intrastate carrier—being mandated or forced to carry gas, if you terminated the contract.

I have got a take or pay contract with you; and January 1, 1985 comes up, and we haven't been able to renegotiate; so you terminate the contract. It was high-priced gas or something, so you terminate the contract.

You wouldn't object at that time, then, if you—and we had a long-term contract—if you terminated the contract, then, being required, in effect, to transport the gas to another pipeline for me.

Mr. **Hughes**. Senator, I believe that's already provided in the bill. If we canceled, we have to——

Senator **Nickels**. All right. Let me turn that around. But your——

Mr. **Hughes** [continuing.] But, as I understand it, the interstates, whether they have canceled the contract or not, if someone comes to them and says I have some gas, and it's not gas that they canceled, but I have some gas and I want you to haul it to one of your end users, now, I believe that is the difference. I think both the interstates and the intrastates have—must transport if they cancel.

Senator **Nickels**. Then the portion that you kind of object to would be, then, if the producer terminated the contract. You have either party out. You have market out on either side.

Mr. Hughes. Yes.

Senator Nickles. OK. Gentlemen, I appreciate——

tract, let's say; that is, an old contract, and you were paying 40 cents, and you offered to pay him 80 cents, and he says, no, I am not going to sell it to you, I can sell it to the city of Buffalo, N.Y., for $2; but I need your interconnect to get me on to Tennessee Gas or somebody, then you would object to having that producer being able to—that being mandated for you to carry his gas to interconnect.

Mr. Hughes. Yes, sir. Of course, we would not propose that the producer could cancel. But if he could, I wouldn't want to have to haul for him.

Senator Nickles. OK. Gentlemen, I appreciate——

Did you have another question or comment, Mr. Haney?

Mr. Haney. One other comment, Senator.

I may not have been clear awhile ago. But on this subject we do feel that there should be some mechanism by which we can buy straight from the producer and have the pipeline become contract carrier or what have you; that you would give us some option and it would also give ONG an impetus to provide us the best service at the best price.

Senator Nickles. You would like to have that hammer on their head, then.

Mr. Haney. Sort of, I suppose.

Mr. Hughes. If there is something in it for us, we will do it. If not, no.

Senator Nickles. Mr. Hughes, one final question. And this is, maybe, just to give you a chance to rebut a comment that's going to be made in just a couple of minutes by Mr. Cleveland.

He discusses the effect of your pending rate case, et cetera.

How do you answer a charge if somebody says, yes, we have a surplus of natural gas in Oklahoma. We have several producers that have been saying gas prices have been falling substantially; particularly in the last year, we have seen deep gas prices fall dramatically in Oklahoma.

How do you answer a person's complaint that despite the fact that gas prices have been declining, yet ONG or other companies—I am not really just trying to single out ONG, but you are mentioned in this one—would be seeking rate increases before the Corporation Commission?

Mr. Hughes. Well, the two are completely unrelated. Our cost of gas adjustment is not part of our rate hearing.

Our rate hearing is concerned with the service portion of our rates, not our cost of gas. Those are entirely separate.

As to why, I think it's pretty obvious why we can't get our flowing gas prices down to the new gas offered prices, because the contracts simply don't permit us to do that.

We do have market-out clauses, as I said, on all the contracts we have written after the NGPA date. But it's only effective on deregulation. We can't get out of the 102 price that we have agreed to pay. There is no mechanism for that.

Senator Nickles. Can you get out of 107?

Mr. Hughes. No, we can't get out of 107 on the pre-NGPA. I am talking about the post-NGPA.

We have written no 107 contracts after NGPA. We have bought no 107 gas, on purpose. We simply had people drill on old contract acreage, on pre-NGPA contracts, that had no market out. But we didn't buy it on purpose. If we had bought it on purpose, I am sure we'd have a market out. But——

Senator NICKLES. So post-NGPA on 102 or 103, do you have market outs on those?

Mr. HUGHES. No, sir. Only—only at deregulation do we have a market out.

We thought that's all we needed. Again, who thought that the market was going to clear in 1982?

We all knew it was going to clear in 1985. We certainly didn't anticipate the nationwide market clearing in 1982.

Senator NICKLES. Again, to answer some of the critics that would say, well, why is ONG, if gas prices have been falling, asking for a rate increase? How do you——

Mr. HUGHES. Well, the point is, if we could go out and buy new gas at a lower price, we could get our costs down. But, obviously, when you've got 400 or 500 million a day shut in right now that you can't take and nobody else wants, we have even offered to release many of these contracts.

We did release some last summer, before the crunch really got bad. But you can't even release the contracts now. Nobody wants a release.

You've got wells out there that nobody will give you a contract for. We have, in our own producing affiliate. So there is a——

Senator NICKLES. As your own affiliate, you can't talk yourself into renegotiating?

Mr. HUGHES. We don't want to buy our affiliate's gas. We like the other deals that the interstates offer us better, normally.

But I don't see that there's any relation. In fact, the——

Senator NICKLES. So it has nothing to do with the amount of money that you are paying for the gas or the——

Mr. HUGHES. That's right. Our rate hearing is concerned with the service charge. All the things that we do, automobiles, salaries, stockholder dividends, everything that we do, taxes, is in that rate hearing.

Now, the cost of gas is completely separate. But if the cost of gas gets up so that we lose load, which we have, we have lost—we lost three refineries already. They are completely shutdown. We feel like it looks like we have lost about 200 million a day out of a, say, 900 million a day load with similar weather this time last year. And you really can't pick out other than one of the co-ops, finish a coal plant during that period, that would be about 45 million a day, or about one-fourth of it. And the refineries would probably be another one-fourth. But the rest of it is just miscellaneous small plants that have closed down because of the——

Senator NICKLES. All right. Given that reduced volume, does that mean that the surviving residential and industrial customers are having to bear a greater percentage of your costs?

Mr. HUGHES. It certainly has something to do with our rate increase, because when we lose load, that's just that much revenue that we don't get. And, as has been stated earlier, you lose the industrial load. In this case, we don't know that it's all industrial load. It's just that our overall load is down about 200 million a day.

So that just means that we got that much less money to operate on.

So, definitely, when you lose load, you have to raise rates, if you are going to keep the middleman viable.

Senator NICKLES. Well, we appreciate your statement, Mr. Hughes, and also, Mr. Haney, your statement, and also cooperation before this committee and some of the comments and suggestions that both of you had are appreciated, and we look forward to working with you in the years ahead.

Thank you very much.

Our next guest will be Mr. Charles Cleveland representing the Coalition for Fair Utility Rates.

[Whereupon, a recess was taken.]

Senator NICKLES. Our next witness is Charles Cleveland, representing the Coalition for Fair Utility Rates.

Mr. Cleveland, welcome before the committee, we appreciate your input on these hearings.

STATEMENT OF CHARLES CLEVELAND, DIRECTOR, THE COALITION FOR FAIR UTILITY RATES

Mr. CLEVELAND. Thank you very much. I appreciate the opportunity to present some consumer viewpoints into the proposed legislation.

I think it's time for some clear understandings about the present natural gas situation.

No. 1, the present regulation fixes a maximum charge for various categories of natural gas.

No. 2, there is a long-term gross over supply of natural gas. Along with oil, this has appropriately been described as a glut.

No. 3, therefore, according to the unwritten law of supply and demand, prices should go down, not up, until demand balances with supply, without any congressional action.

Further the present law with scheduled phased deregulation adequately provides for all categories of gas. The cheap old gas, which if decontrolled would abnormally escalate in price. In consequence, the present decontrol proposal can only result in higher combined category natural gas prices.

In our continuing state of economy, this must be described as utter folly, diametrically opposed to tumbling oil prices and encouraging a turnabout and conversion of use of natural gas to oil.

To emphasize how ridiculous the situation currently is, we need only to look at the requests for rate increases by the natural gas suppliers, including ONG [Oklahoma Natural Gas], as we mentioned earlier.

Oklahoma Natural Gas claims correctly that revenues are down because of reduced consumption, due to user conservation and in some cases loss of customers due to bankruptcy, plant closings, et cetera. In other words, ONG and others want to increase rates because consumers used less; but consumers used less because the rates were increased.

It seems to be a case of the tail wagging the dog and one trying to catch the other.

If this degenerating cycle is repeated, it creates the utility death spiral, bankrupting utility and consumer alike.

I would like to cite an example in ONG's case. They are now asking for $88 million before the Oklahoma Corporation Commission, cause 28609. Their previous recent increases granted by the commission were for $30 million, $29 million, and $48 million, rounded off, just to round millions.

In the last 10 years ONG has increased its charges to the average customer, that's overall, by 640 percent. Considering that there are presently more than 30 utility rate cases pending before the Oklahoma Corporation Commission, we can understand the very frightening prospect of the user being sucked into the vortex of the utility death spiral.

Shifting now to the national scene, estimates of the impact of the proposed deregulation are placed at 67 percent increase by the Citizens Labor Energy Coalition, and by the gas industry itself—and this is an extra $60 billion a year. This has been quoted by—it either equates to approximately a $600 burden per worker per year increase over and above other utility rate increases, and present utility rates, in the United States, and would push our present record levels of bankruptcy upwards, above and beyond any level of tolerance.

Hopefully, the growing roar of grassroots opposition will forever bury this natural gas deregulation proposal. If it doesn't, we hope this Senate committee had best prepare the Senate as a whole for an alternative to the proposed disruptive diversion of our economy.

And to see what impact this is, you can look at the Fortune 1,000 Report, that is the report of large, 1,000 corporations in the United States. They reported that 94 percent of profits went to the energy sector, effectively diverting funds that normally would have gone to the rest of the economy for an orderly growth. And that relates to our record level of bankruptcies, I guess.

The desire for short-term maximum profits by many of this administration's constituency could push us into a depression approaching or exceeding that of the thirties, or in a deficit beyond comprehension, if not promptly stopped.

We recommend that Congress attack the problem by approaching many of the points that have been presented here today. And to solve this long-term oversupply by, No. 1, abolishing the take or pay clauses in present contracts, and prohibiting them in future contracts.

Abolish the escalator contracts, or clauses in present contracts, and prohibit them in future contracts.

Require suppliers to purchase the lowest price natural gas for distribution.

Require pipelines to act as common carriers, so the distributor supplier could have access to lowest price natural gas.

These four points would allow a balance of supply and demand, consumer costs would go down, the gas industry would remain solvent, and the death spiral avoided.

All the citizens, businesses and farmers now struggling to survive would applaud you. And I think Congress would be unable to resist this approach, if you offer it.

The alternative is more chaos. Citizens are organizing in every State, including Oklahoma, to take these matters into their own hands. The growing awareness that we have the best regulatory agencies money can buy is spurring petition drives, repealing construction work in progress, prohibiting automatic fuel passthrough costs without hearings. This has been a factor in political races.

The bias against the consumers by regulatory bodies such as the Oklahoma Corporation Commission and the Federal Energy Regulatory Commission is apparent to an ever larger, fast-growing number of citizens, whose patience becomes thinner and thinner and thinner with each rate increase.

We are now aware, additionally, to the long-term oversupply of natural gas, there is a parallel oversupply of electric generating capacity, more than 100 percent of what is not calculated, but a national coincident peak. I would like for your committee to come up with a number on that, if we could.

Many of these utilities use natural gas as a fuel source. We are literally paying for twice the needed capacity, making utility threats of blackouts and brownouts totally ludicrous.

And, by the way, as mentioned earlier, part of the loss of ONG's customer was from the plant being built in southeast Oklahoma, the Hugo plant for western farmlands, and also GRDA has a new plant.

We are aware that not only are citizens in other States having to pay off canceled nuclear plants, but that every Public Service Co. of Oklahoma customer, along with about 40 Oklahoma co-ops and municipalities are paying off this Black Fox abortion, about 500 million dollars' worth, that's further added to our problems. And that doesn't include the interest—I'm sorry—it does include the interest on the ratepayers' money, plus a profit to preferred stockholders.

We are also aware that OPEC petro dollars are being reinvested in U.S. utilities, and even that the Rural Electric Administration is suggesting that co-ops like Western Farmers go offshore for loans, as if the OPEC sovereign loan scandals threatening our banks weren't enough.

We are aware that the Southwestern Power Administration wants a 38-percent increase in their rates, and Southwestern Bell, by the way, wants another $138 million.

We are aware that a lot of political pressure is being brought to bear by the energy sector to sustain their high profits.

We can only ask that the dedicated honorable Senators of the Committee on Energy and Natural Resources realistically measure the impact of past energy and utility increases on the economy. Add to this the impact of the scheduled and pending increases, including natural gas deregulation proposal, and consider it in total, rather than piecemeal.

Then we pray you to act to redirect some significant profits back to other segments of the economy, in order to stimulate and hasten recovery, full employment, and an end to our astronomical deficits.

And, finally, I would like you to permit me to quote from a news release sent to the Coalition for Fair Utility Rates on March 24 of this year by the chairman and chief executive officer of the Northwest Central Pipeline Corp. This was formerly Cities Service. I see they are mentioned on the program. In connection with their $218 million rate reduction request, I quote:

> High costs have not only been devastating to the residential user, but have caused the loss of a significant portion of our industrial sales, due to the fact that we can no longer compete with alternate fuels such as industrial fuel oil. In turn, this causes even higher prices to residential users. Only lower prices can reduce this trend and return some semblance of sanity to the natural gas market.

[The prepared statement of Mr. Cleveland follows:]

The Coalition For Fair Utility Rates
4620 East 11th Street Room 205 Tulsa, OK 74112
(918) 835-5090

™ RateWatcher

STATEMENT TO THE UNITED STATES SENATE ENERGY AND
NATURAL RESOURCES COMMITTEE, PUBLIC HEARING,
TULSA, OKLAHOMA, MARCH 28, 1983

The more than 10,000 associated members of The Coalition For Fair Utility Rates, known as RateWatchers, earnestly implore the Honorable members of the United States Senate Energy and Natural Resources Committee to seriously consider the following in their deliberations on the natural gas deregulation proposal.

It's time for some clear understandings about the present natural gas situation.

1) The present regulation fixes a "MAXIMUM" charge for various categories of natural gas.
2) There is a long term gross over-supply of natural gas. Along with oil, this has appropriately been described as a "glut".
3) Therefore: according to the unwritten law of "supply and demand", prices should go down, not up, until "demand" balances "supply" WITHOUT ANY Congressional action.

Further, the present law with scheduled phased "deregulation" adequately provides for all categories of gas. The "cheap old gas", which if "decontrolled", would abnormally escalate in price. In consequence, the present decontrol proposal can only result in higher combined category natural gas prices. In our continuing state of the economy, this must be described as utter folly, diametrically opposed to tumbling oil prices and encouraging a turn-about from gas to oil.

To emphasize how ridiculous the situation is, we need only to look at the requests for rate increases by the natural gas suppliers, including Oklahoma Natural Gas (ONG). ONG claims correctly that revenues are down because of reduced consumption due to user conservation and in some cases loss of customers due to bankruptcy. In other words, ONG and others want to increase rates because consumers used less but consumers used less because the rates were increased. It seems to be both a case of the tail wagging the dog and the one trying to catch the other.

If this degenerating cycle is repeated it creates the "Utility Death Spiral" bankrupting utility and consumer alike.

Let me cite an example: ONG is now asking for an $88 million increase (Oklahoma Corporation Commission (OCC) Cause No. 28069).

Their previous recent increases granted by the OCC were for $30, $29, and $48 million. In the past 10 years, ONG has increased its charges to the average customer by 640%!. Considering that there are presently more than 30 utility rate increases pending before the OCC, we can understand the very frightening prospect of the user being sucked into the vortex of the UTILITY DEATH SPIRAL.

Shifting now to the national scene, estimates of the impact of the proposed deregulation are placed at 67% increase by the Citizens/Labor Energy Coalition and by the gas industry at an extra $60 BILLION per year. Either equates to approximately a $600 burden per worker per year in the United States and would push our present record levels of bankruptcy upwards, above and beyond any level of tolerance.

Hopefully, the growing roar of grassroots opposition will forever bury this Natural Gas Deregulation Proposal.

If it doesn't, this Senate Committee had best prepare the Senate as a whole for an alternative to the proposed disruptive diversion of our economy. To emphasize this, the Fortune 1000 Report showed 94% of profits went to the energy sector, effectively diverting funds that normally would have provided for orderly growth of the rest of the economy.

The desire for short-term, maximum profits by many of this Administration's constituency could push us into a depression approaching that of the 1930's, or in a deficit beyond comprehension, if not promptly stopped.

How should Congress attack the problem of increasing natural gas prices in the face of long-term oversupply?

1) Abolish the "take or pay" clauses in present contracts and prohibit them in future contracts.
2) Abolish "escalator" clauses in present contracts and prohibit them in future contracts.
3) Require suppliers to purchase "lowest price" natural gas for distribution.
4) Require pipelines to act as "common carriers" so distributor/supplier could have access to "lowest price" natural gas.

These four points would then allow a balance of supply and demand, consumer costs would go down, the gas industry would remain solvent and the death spiral avoided.

All the citizens, businesses and farmers now struggling to survive would applaud you. Even Congress would be unable to resist this approach if you offer it!

The alternative is more chaos. Citizens are organizing in every state, including Oklahoma, to take these matters in their own hands. The growing awareness that we have "the best regulatory agencies money can buy" is spurring petition drives, repealing construction work in progress, prohibiting automatic fuel pass-through costs, and has been a major factor in many political races.

The bias against the consumers by regulating bodies such as the OCC and the Federal Energy Regulatory Commission (FERC) is apparent to an ever larger, fast growing number of citizens whose patience becomes thinner with each rate increase.

We are now aware that, in addition to the long term over-supply of natural gas, there is a parallel over-supply of electric generating capacity (more than 100% at a "national coincident peak") and many of these utilities use natural gas as a fuel source. We are literally paying for twice the needed capacity, making utility threats of blackouts and brownouts totally ludicrous. (GRDA and OG&E in Oklahoma are building even more capacity.)

We're aware that not only are citizens in other states having to pay-off cancelled nuclear plants, but that every Public Service Company of Oklahoma customer, along with about 40 Oklahoma Co-ops and municipalities are paying off PSO's Black Fox abortion (about $500 MILLION) including interest on the ratepayers money, plus a profit to preferred stockholders.

We are also aware that OPEC petro-dollars are being "re-invested" in U.S. utilities and even that the Rural Electric Administration is suggesting that Co-ops like Western Farmers go "off-shore" (OPEC) for loans, as if the OPEC sovereign loan scandals threatening our banks weren't enough.

We are aware that the Southwestern Power Administration wants a 38% increase and even Southwestern Bell wants in on the action, asking for $138.5 million.

We are aware of the political pressure being brought to bear by the "energy sector" to sustain their high profits.

We can only ask that the dedicated Honorable Senators of the Committee on Energy and Natural Resources realistically measure the impact of past energy and utility increases on the economy. Add the impact of the scheduled and pending increases, including the natural gas deregulation proposal, and consider it in total, rather than piecemeal.

Then, we pray you act to re-direct some significant profits back to other segments of the economy in order to stimulate and hasten recovery, full employment and end our astronomical deficits.

Finally, permit me to quote from a news release sent to The Coalition For Fair Utility Rates on March 24, 1983 by the Chairman and Chief Executive Officer of the Northwest Central Pipeline Corporation in connection with their $218 million rate REDUCTION request -

> "High costs have not only been devastating to the residential user, but have caused the loss of a significant portion of our industrial sales due to the fact that we can no longer compete with alternate fuels such as industrial fuel oil. In turn, this causes even higher prices to residential users. Only lower prices can reduce this trend and return some semblance of sanity to the natural gas market."

Respectfully submitted,

Charles Cleveland, P.E.
Director, The Coalition For
Fair Utility Rates

Senator NICKLES. I thank you very much, Mr. Cleveland. Let me ask you a couple of questions, if I might.

A general question would be, do you favor decontrol of natural gas? Or do you oppose it in all forms? Maybe that would be the way to ask it.

Mr. CLEVELAND. Theoretically, I like a free and open market. However, we must recognize that we monkeyed around on this market to the point now that we have created a situation where there is a gross oversupply. And I am in favor of reregulation, rather than deregulation and decontrol at this time.

I think we are going to have to—we must take some interim steps, because the Government has imposed some restrictions and fiats in there already, that have to—several of those you did not anticipate, and I don't think anybody should have been able to have anticipated. I don't think anybody should take blame for it.

But the take or pay contracts—the industry needs help with that. They cannot do that by themselves. They have said so here today.

I think we need to provide some options to the pipelines, that require them to act as a common carrier, so there can be access out there for the lowest price; and the same with the escalator prices.

Senator NICKLES. So we would never work toward a totally deregulated natural gas market.

Mr. CLEVELAND. Well, I tend to try to go back to—if there is competition out there, I would like to go to a deregulated market. If we are in a situation where many of the factors——

Senator NICKLES. Do you feel like there's not competition in the natural gas market?

Mr. CLEVELAND. Well, let me finish my statement.

In many sectors of it, it's controlled by the Oklahoma Corporation Commission, Federal Energy Regulatory Commission, and other regulations by the Government. So I think that it's truly unrealistic to talk about total decontrol. That can't happen, and won't happen, because of the constitutions of the various States on the controls that they apply on electric power, sales of natural gas to produce that electric power, utilities. They are in the gas supply business. The pipeline regulations, et cetera. So I think that's an unrealistic approach to take to say we are going to totally decontrol, and totally deregulate. But that's not reality. That just can't happen or won't happen.

Senator NICKLES. Well, the——

Mr. CLEVELAND. It's nice to talk about, but that's not the real world.

Senator NICKLES. Well, some of us are—I don't know—I don't think the administration or anyone is saying that we are going to eliminate controls that the States now have, various corporation and utility commissions that are in each of the 50 States. But the only product that is controlled at the production point, the only raw material, the only product that is actually controlled at the production point in the United States of America today is natural gas. The only energy source that's controlled at the production point, where you have the Federal Government actually controlling the price at the wellhead.

Do you think that eventually we should get the Federal Government's involvement out, or away, or eliminate those productions at the wellhead?

Mr. CLEVELAND. Well, to go back to the very first of my statements, we have maximum prices on that now. The oversupply of natural gas should indicate those maximum prices would become moot, due to the supply problem.

Senator NICKLES. Do you find sometimes, that maybe the fact when you have various price categories—this has been discussed and debated in Washington—I don't know if there is a consensus, but sometimes when you put in price ceilings, that sometimes they become floors?

Mr. CLEVELAND. I think we have seen that in many cases here, and from some of the evidence presented to you today, indicates that we have a chaotic system. I don't think anybody wants to dispute that. Where you have very expensive gas being mixed with very inexpensive gas, and—produces so many Btu's and the customer doesn't care whether it's expensive or nonexpensive gas. What they care about is their bill.

Now, again, the present regulation, I think, is well-intentioned and varies State by State, based on what each State has done.

I think the best thing right now that can be done, is to address those issues that are the biggest problem in this situation. And it isn't the fact that we have a maximum price on gas. I think that's a—could miss the target completely to be talking about deregulation, and trying to do something with a maximum, or a ceiling, or a lid that's on out there right now, which isn't what's causing the problem right now. And to divert and to supply considerable effort and energy into that area would be to avoid, or to miss the point of putting effort and energy into the areas that require immediate attention.

There are some serious problems out there, not just with residential customers, that wintertime they are having the old question of heat or eat, all across the country; but also with fertilizer manufacturers that you heard here today; the industrial customers.

It seems almost strange to see the fertilizer manufacturers and the Coalition for Fair Utility Rates agree on something, since we fight tooth and nail so often, fighting the rate increases. But there are some real problems out there. We don't want them to go out of business. We don't want the utilities to go out of business.

Senator NICKLES. Would you favor, say, some in Congress have proposed a 2-year freeze on gas prices at the wellhead as they are today under NGPA. Would you favor that?

Mr. CLEVELAND. No, I don't think anybody ought to freeze anything right now.

I think we need to provide more flexibility right now. The present maximums are moot. They don't matter right now. I think we can ignore those maximums. We can ignore the price-fixing provisions that people are looking at right now, and let those sit, and leave them alone for a little while; and come back in and do some work on abolishing the escalator clauses, the take or pay, in regard to pipelines to act as the common carrier, and to provide more freedom and flexibility in the marketplace, I think, is the problem right now.

To talk about the price controls that are affecting the market right now—it's just the point.

Senator NICKLES. One additional question. You mentioned in your statement that you felt like—correct me, if I am wrong—if we deregulated natural gas that it could cost $60 billion a year, or $600 per family, or something like that.

Mr. Cleveland. I am quoting figures that Senator Metzenbaum has released, I am sure, to the Senate; distributed in the major publication.

Senator Nickles. Do you agree with those? Have you done any homework that——

Mr. Cleveland. That's why I quoted two or three, so that you can take your pick from the Citizens Labor Energy Coalition, from Senator Metzenbaum's quotations. I think you will find if you ask the questions here, 87 different answers if you had 87 different people.

Senator Nickles. I might——

Mr. Cleveland. One point is that since the ceiling right now is affecting only the low-cost old gas, if you do deregulate right now, that's the only thing that's going to affect it right now, which says the only way the price can go is up.

Now, I think that's the wrong approach to take at this time, particularly when you have Oklahoma Natural Gas and other gas companies, fertilizer manufacturers, refineries, saying we need to lower gas prices right now; and to do the opposite of that, I think, would fly in the face of the difficulties we are having in the economy at this time.

Senator Nickles. I wouldn't agree with that statement, because I—conversely, I think if this bill was enacted, you would see a decline in gas prices, as you might have heard from some of the independent producers, because of the gas cap and the passthrough limitation and others.

There is substantial consumer protection that the administration designed to put in the bill that many of us think possibly might be counterproductive in the long term for consumers, and others in the industry.

I might also just make one comment, and I do appreciate your coming. But in your quotation of Senator Metzenbaum, I was amused. I read one of his statements on the decontrol of oil, which sounded very similar to the statement on decontrol of gas. And in his statement on decontrol of oil, it was in 1981, he said the price of oil within 1 year would be up to $2 a gallon. And so sometimes we have to look at some of the forecasts that many of us make, and maybe look back and see how credible they turn out to be in reality.

But we do appreciate your statement before the committee, Mr. Cleveland. Thank you very much.

Mr. Cleveland. If I may, as I asked earlier, to respond to a portion of Mr. Hughes' statement as to a slight difference we have before the Oklahoma corporation commission.

I think it's almost misleading to state that the difficulty with the rate increase that ONG is looking at right now is not really the gas prices.

What we are seeing, and I think Mr. Hughes is right as far as he went with it in his answer. However, there's a difficulty with the overall gas price going up. And when you couple that with such as ONG, and other utilities that have not taken steps, that the other businesses in our communities have taken, to institute austerity programs to cut expenses back, we have a situation where a company is being priced out of the market because the cost is so high, they are going back in and asking for a rate increase, which will cause a further decline in the total consumption, which will cause another reduction in the total revenues. And that's what I tried to describe as the utility death spiral.

I agreed with the statement that the present request before the Commission is not directly related to the fuel costs, that is the natural gas costs; but it does affect that. So as the price totally does go up, it will affect his market and the impression that the committee is being given in the previous statements, is that it is understandable and reasonable for them to ask for more money, because their market has gone out from under them is not a true statement.

No other business in the free marketplace out there, can afford to increase prices where they are losing customers, because their prices are too high. That's fictitious and that's folly, and I hope the Commission and Oklahoma Natural Gas is aware of it.

Senator **Nickles**. Thank you very much for your statement.

Our next and final panel that we have consists of Charles Waidelich, chairman of the board at Cities Service Co., and Bryan Whitworth, vice president of government relations, and also Bill Gaul, manager of laws and regulations, with Phillips Petroleum.

Welcome. And do you have accompanying statements?

Mr. **Waidelich**. Yes.

Senator **Nickles**. If you do, we will make those a part of the record, and you can summarize, or make whatever comments you wish to make on the legislation before us.

So, thank you for being here. Mr. Waidelich?

Mr. **Waidelich**. Do you want me to leadoff, Senator?

Senator **Nickles**. Yes, please.

STATEMENT OF CHARLES J. WAIDELICH, CHAIRMAN OF THE BOARD AND CHIEF EXECUTIVE OFFICER, CITIES SERVICE CO.

Mr. **Waidelich**. All right.

My name is Charles Waidelich. I am chairman of the board and chief executive officer of Cities Service Co., headquartered here in Tulsa.

Cities Service, which is a subsidiary of Occidental, is primarily a producer of domestic oil, natural gas, and natural gas liquids. Our natural gas reserves which rank ninth in the industry are dispersed among some 18 States, on the Outer Continental Shelf. We are currently supplying gas to approximately 70 interstate and intrastate pipeline companies.

As a major gas producer, Cities Service Co., has an abiding interest in the outcome of the current debate over the administration's legislative initiative to decontrol the price of all natural gas by 1986. I realize fully the political sensitivity and downright complexity of the issues raised by this proposal. The issue touches, in some degree, virtually every segment of American society.

The magnitude of importance attached to the issue is evidenced by the impressive array of individuals who are testifying before this and other prominent congressional committees. May I say how very pleased I am to have this opportunity to join such distinguished company in sharing my views with the members of this committee on the key issues shaping the debate.

I want to say straightaway that I endorse in its entirety the legislation proposed by the President. I do so not because it will act as an instant panacea for all the ailments currently afflicting both consumers and the natural gas industry. I do so not because all its elements will prove beneficial to Cities Service.

I do so because it is a balanced package that relies primarily on the marketplace, rather than the legislative process to reconcile the inequities created by the existing regulatory system.

Congressional action to amend the bill to accommodate the narrow concerns of each special interest will exacerbate existing disparities and guarantee renewed congressional intervention within a short period of time.

The principal strength of the administration's bill lies in its comprehensive, farsighted approach. It is not a quick fix aimed, for example, at merely lowering gas prices now. It is not based on rigid forecasts of rising or falling prices for alternate energy sources.

It is not based on the assumption of prolonged shortages or surpluses; but, rather, on the assumption that the market is in a continual state of flux in response to changing patterns of supply and demand.

During recent hearings on natural gas held by this committee, the concerns of Senators and witnesses focussed on three principal questions:

What will the price of natural gas be in a deregulated market?

How should the terms of existing contracts be changed?

And, finally, what impact will the decontrol of old gas have upon the market?

I will address myself first to that first question, that of price. The question regarding future price of natural gas lies at the heart of the entire decontrol issue. I don't know what the price of gas will be in a deregulated market. No one does.

I am convinced, however, that prices will not skyrocket, as some have predicted. There are a number of features in the administration's program that will have immediate dampening effect on prices. First of all, prices would be limited during the transition period ending on January 1, 1986, by the lower of the current NGPA ceiling prices or the proposed gas cap. Immediately upon decontrol in 1986, there should be no price fly-up, because prices will already be at market clearing levels. Indeed, it is entirely possible that prices will fall.

The renegotiation process involving all gas contracts will create downward pressure on price of new gas currently being sold at rates above market clearing levels.

Although the price of old gas will increase with decontrol, the average price will fall below current rates. Moreover, increased competition in today's buyer's market will exert considerable downward pressure on prices. Vigorous competition will compel natural gas producers and pipelines either to provide consumers with the least-costly supply mix, in order to maintain the integrity of their customer base, or risk damaging interruptions in cash flow.

Next, the contracts question. The contracts issue has generated considerable controversy. The take or pay provisions for so-called new gas contracts are at the very center of the evolving debate.

These stipulations require pipelines either to accept delivery from producers of a specified percentage of the agreed-upon annual volume, or pay for it anyway.

The terms of these contracts were perfectly acceptable to the pipelines when they were signed during a period of gas shortages. These contracts were, after all, the product of a competitive bidding process and not the unilateral demands of producers. The producers merely accepted the best price offered by competing pipelines.

In the meantime, the addition of new gas reserves has combined with falling demand to produce a surplus. Many pipelines are now appealing for legislative action to rollback prices and moderate take or pay commitments. They argue that the contracted prices of $5 to $10 per thousand cubic feet no longer reflect current market conditions. Yet many of these same pipelines are buying old gas from the very same producers for no more than the legal limit of 46 cents per thousand cubic feet. No one would argue that the 46-cent price tag for old gas accurately reflects today's market. However, I know of no pipeline with access to old gas which is advocating legislative action to remedy this situation.

The administration has correctly recognized that the present market distortions will not be eliminated unless the old and the new gas contracts questions are addressed. The mutual market out and renegotiation provisions to deal with this matter are among the most ingenious features of the administration's bill.

Next, the old gas question. A number of critics object to the decontrol of old gas on the grounds that it will precipitate a transfer of considerable wealth to major gas producers. These arguments ignore the fact that downward pressure on new gas prices exerted by decontrolled old gas will force these same producers to relinquish a portion of their present earnings currently derived from new gas sales.

The most outspoken opposition against decontrolling old gas has come from certain pipelines with access to old gas; while these same pipelines enthusiastically endorsed the deregulation of new gas, they adamantly oppose lifting price controls on the 46-cent gas I alluded to earlier.

This committee must have a clear understanding of why the pipelines are insisting upon retaining price controls on old gas. Their motives are essentially self-serving. These pipelines are exploiting the old gas cushion to enhance their competitive posture in bidding for new domestic supplies, subsidize their purchase of expensive imports, and inflate new gas prices above market clearing levels, all to the detriment of the consumers.

Meanwhile, the pipelines are using arguments couched in consumer protection rhetoric, to obscure the fact that they, not consumers, are the chief beneficiaries of continued regulation of old gas.

Domestic natural gas is one of our most important natural resources. The benefits derived from our gas reserves should be shared equally among all consumers and the industry. This worthy goal will be unattainable so long as old gas prices remain controlled.

I would like to conclude by reiterating my strong belief in the phased, orderly decontrol of all natural gas, as proposed by the administration. I believe this course of action is in the best interests of American consumers, the domestic natural gas industry, and, indeed, the Nation as a whole.

As long as even partial Government price controls remain in effect, market distortions will persist. The actual experiences of the decontrolled oil market demonstrate that deregulation is not synonymous with price increases. I believe that the total decontrol of natural gas will work to the advantage of consumers by stimulating competitive pricing, encouraging new exploration and production, making natural gas more competitive with other less environmentally safe energy resources, and displacing high-cost imported gas.

Opposition to the administration's legislative initiative to decontrol all gas has largely been based on its potential impact on particular vested interests. The administration's bill, to its credit, seeks to strike a balance among these competing interests.

The administration's approach may not bring about the best of all possible worlds for each of us individually, but it will help insure a better future for all of us collectively.

Thank you.

[The prepared statement of Mr. Waidelich follows:]

Prepared Statement of Charles J. Waidelich
Cities Service Company
For the Committee on Energy and Natural Resources
United States Senate
March 28, 1983

My name is Charles J. Waidelich. I am Chairman of the Board and Chief Executive Officer of Cities Service Company, headquartered in Tulsa, Oklahoma. Cities Service Company is a wholly-owned subsidiary of Occidental Petroleum Company. I was elected Vice Chairman of the Board of Occidental Petroleum Company on December 16, 1982, following its acquisition of Cities Service Company on December 3, 1982.

Cities Service Company is primarily a producer of domestic oil, natural gas and natural gas liquids. Our natural gas reserves, which rank ninth in the industry, are dispersed among some eighteen states--including Alaska, California, New Mexico, Colorado, Wyoming, North Dakota, Kansas, Oklahoma, Texas, Louisiana, Arkansas, Mississippi, Alabama, Kentucky, West Virginia, Pennsylvania, Michigan and Utah. We have additional gas reserves located on the Outer Continental Shelf. We are currently supplying gas to approximately 70 interstate and intrastate pipeline companies.

As a major gas producer, Cities Service Company has an abiding interest in the outcome of the current debate over the Administration's legislative initiative to decontrol the price of all natural gas by 1986. I realize fully the political sensitivity and downright complexity of the issues raised by this proposal. The issue touches in some degree virtually every segment of American society. The magnitude of importance attached to the issue is evidenced by the impressive array of individuals who are testifying before this and other prominent congressional committees. May I say how very pleased I am to have this opportunity to join such distinguished company in sharing my views with the members of this Committee on the key issues shaping the debate.

I want to say straight-away that I endorse in its entirety the legislation proposed by the President. I do so not because it will act as an instant panacea for all the ailments currently afflicting both consumers and the natural gas industry. I do so not because all its elements will prove beneficial to Cities Service. I do so because it is a balanced package that relies primarily on the marketplace rather than the legislative process to reconcile the various conflicting interests accentuated by the inherent inequities in the existing regulatory system.

Indeed, I could in fact object strenuously to certain features of the bill that will have a negative effect on Cities Service if they stood alone. But like the Social Security rescue plan approved last week by the Congress, the natural gas decontrol proposal should be considered as a package. There are so many vested interests involved that congressional efforts to modify the bill to satisfy the narrow concerns of each faction will merely exacerbate rather than eliminate existing disparities and virtually guarantee renewed congressional intervention within a short period of time.

The Natural Gas Policy Act (NGPA) is a case in point. Enacted in 1978, the NGPA was intended to restore some semblance of a free market in natural gas, while at the same time protecting the consumer from sudden, sharp price hikes. Yet it is these very regulations, designed to shield the gas consumer from high prices, that are responsible for the current increase.

Rather than eliminating market distortions, the NGPA has magnified them. It made natural gas regulations more complex instead of simplifying them. It promoted investment in the highest cost sources of gas at the expense of low and moderately priced supplies. Most important, it reduced, rather than enhanced, the power of gas consumers to influence the operation of gas markets because of its inherent inflexibility.

As the various witnesses appear before this Committee, it is imperative for the members to reflect upon the frenetic lobbying activities and political horse-trading that preceded passage of the NGPA. While the NGPA has failed as a policy instrument, certain inequities inherent in the regulatory formula have created specific advantages for some segments of the industry at the expense of others--along with consumers. The diversity of interests fashioned by the NGPA is apparent in the testimony presented to this Committee. You need only recall the arguments of a broad range of industry spokespersons, who have testified in support of legislation that would benefit their particular company, not just their segment of the industry.

The natural gas industry clearly is not a monolithic entity. It is instead a highly diverse industry comprised of numerous producers, pipelines and distributors with widely disparate, yet interdependent, interests. The disparities themselves are in large measure the culmination of more than 30 years of regulation which has created market imbalances and distortions whose impact has been unequally felt both within, and among, the various industry segments. Certain regulatory requirements in the past have benefited producers at the expense of pipelines and distributors; others have worked to the detriment of distributors and producers while enhancing the posture of pipelines. Still other regulations have created an environment in which some producers received various incentives that were denied other producers, or some pipelines gained competitive advantages over their rivals.

What I am suggesting is that the tortuous shifts and turns in the course of natural gas regulation during nearly three decades has ultimately determined what businesses get rewarded and the amount of the reward. At each stage in this evolving process, those segments of the industry which benefitted from the existing statutes sought to maintain those elements which served their interests while seeking the modification or elimination of those deemed harmful.

The NGPA has simply added another dimension to this unfolding pattern. Producers who received powerful incentives to drill for expensive, unregulated deep and tight sands gas want to keep those incentives in place, while maintaining price controls on much cheaper old gas. Interstate pipelines, whose long-term contracts with producers award them exclusive access to permanently-controlled old gas supplies, argue in favor of the continuation of such controls while demanding that these same producers renegotiate contracts for higher cost gas and agree to accept a lower price. Some producers involved in the production of both old and new gas want to renegotiate the contracts with pipelines for old gas while refusing to alter contracts for new gas. The list of arguments is as varied as the particular interests involved.

As these arguments have unfolded, the focal point of the debate has been those issues that are having an immediate impact on public perceptions. The price of natural gas is rising now despite excess supplies now and falling demand now. Something must be done now to correct this seemingly intolerable situation. The call for action is reminiscent of the appeals that led to the enactment of the NGPA in response to the shortage of natural gas that developed during the severe winter of 1976-1977. Like the myopic military strategists who developed rigid plans for waging the next war based on the tactics employed in the last war, Congress responded by devising a regulatory system that addressed the problems of past shortages but lacked sufficient flexibility to respond to future surpluses. This shortsightedness is responsible for the current problems besetting the natural gas market today.

The principal strength of the Administration's bill lies in its comprehensive, far-sighted approach. It is not a "quick fix" aimed, for example, at merely lowering gas prices now. It is not based on rigid forecasts of rising, or falling, prices for alternate energy sources. It is not based on the assumption of prolonged shortages or surpluses, but rather on the assumption that the market is in a continual state of flux in response to changing patterns of supply and demand.

Some critics have expressed opposition to the entire proposal; others have objected to specific parts. Many of these critics have proposed alternative legislative action. None of them, however, has developed a comprehensive proposal that will assure natural gas consumers of adequate supplies in the future at reasonable prices. Virtually all of the opponents have focused on a single issue--how to bring down the price of natural gas now and keep it down.

Not one of the opponents addresses the issue of adequate supplies in future years. By insisting on a rollback of wellhead prices they have failed to appreciate the temporary character of the current supply bubble. An immediate price rollback will quickly transform today's surplus into tomorrow's shortage. Once producers are denied adequate incentives to risk their increasingly scarce capital in the search for new gas supplies, they will reallocate their resources to more profitable enterprises. To do otherwise would do a disservice to their shareholders.

During the remainder of my allotted time I would like to address three specific questions that have been raised most often in challenging the Administration's proposal.

The Price Question

Critics have charged that the decontrol of all natural gas will inevitably lead to "skyrocketing" prices. Some have suggested that decontrol will cost the American people $60 billion annually. Such forecasts should be regarded with a high degree of skepticism. They are similar to projections of large price hikes when oil prices were decontrolled in 1981. Indeed many of the same individuals who predicted an economic disaster would accompany oil decontrol are advancing the very same arguments in their efforts to block the decontrol of natural gas. It is indeed ironic that one of the major problems currently confronting the natural gas market is the substitution of increasingly cheaper, unregulated fuel oil for increasingly expensive, controlled natural gas.

I don't know what the price of natural gas will be in a deregulated market. No one does! I do not believe, however, that prices will "skyrocket." There are a number of features in the Administration's program is adopted that will have a dampening effect on prices.

First of all, prices would be limited during the transition period, ending on January 1, 1986, by the lower of the current NGPA ceiling prices or the proposed "gas cap." Immediately upon decontrol there should be no price fly up because prices will already be at market-clearing levels. Indeed, it is entirely possible that prices will fall.

There are several persuasive reasons why a decline in gas prices may well accompany decontrol. The price of much of the nation's low cost old gas is slated to remain permanently controlled under the NGPA. Take-or-pay contractual obligations, which pipelines entered into with foreign and domestic producers for newly-discovered high cost gas, have resulted in the pipelines "shutting in" the cheaper old gas in order to accept new gas deliveries. The decontrol of all gas and the renegotiation of all contracts will release much of this lower priced "shut-in" gas to the market, thereby lowering the average costs of all gas by deflating the price of new gas currently being sold at rates above market-clearing levels.

Moreover, increased competition in today's buyers market will exert considerable downward pressure on prices. Vigorous competition will compel natural gas producers to provide consumers with the least costly supply mix in order to maintain the integrity of their customer base or risk damaging interruptions in cash flow.

The Contracts Question

The Administration's proposal to nullify existing private contracts between producers and pipelines which were not renegotiated by January 1, 1985 has caused considerable concern in some quarters. Representatives of some pipeline companies claim the bill provides no incentive for a high-cost gas producer to consent to an immediate downward price revision in the renegotiation process. The worst that could happen to producers, according to this argument, would be to continue to receive the contracted price until 1985 and then remarket gas at the new market-clearing price. Meanwhile, the consumers would continue to pay prices that exceed market-clearing levels. Some members of Congress are troubled by what they regard as government intrusion into the realm of legal contracts among private parties. Self-appointed consumer advocates are fearful that the renegotiation of all current contracts will place the consumer at the mercy of producers who would cut off supplies if their prices were not met. Instead, they are calling for the abolition only of take-or-pay contracts for high cost gas. The public has been molded into believing that the take-or-pay contracts account for the recent increase in gas prices, but the real culprit has in fact been federal price controls imposed on "old" gas contracted for prior to 1978.

Let's look first at the contracts question as it relates to the pipelines. Some pipeline executives maintain that the producers had virtually all the bargaining leverage in negotiating new gas contracts following enactment of the NGPA. They contend that gas producers insisted on and received the maximum prices allowed under the law along with high take-or-pay obligations.

There is no question that producers enjoyed considerable leverage at that point in time in their dealings with pipelines. Gas was in short supply and demand was high. It was in effect a seller's market. Yet it is absolutely false to maintain, as some pipelines have, that the terms of the contracts reflected solely the demands of the producers. Producers frequently received competing offers from a number of pipelines for the same package of gas. The pricing and the take-or-pay provisions were therefore the result of a competitive bidding process, and not the unilateral demands of the producers. The producers, following sound business practices, simply accepted the best offer.

The terms of these contracts were perfectly acceptable to the pipelines at the time they were signed. However, market conditions have changed dramatically during the interim. Now these same pipelines are calling for modifications in the contracts on the grounds that they no longer reflect current market conditions. There is a great deal of truth in this assertion, but it is not the whole truth.

Many of these companies which are appealing for legislative action for relief from contracts for new gas priced between 5 and 10 dollars per thousand cubic feet also have exclusive, long-term contracts from the very same producers for old, low-priced gas. Old gas producers may receive no more than the legal limit of 46 cents per thousand cubic feet. Certainly the 46 cents price-tag for old gas does not accurately reflect current market conditions. Yet I know of no pipeline with access to old gas that is advocating legislative action to remedy this situation.

Most of the complaints registered by pipelines are in response to the squeeze created by the current surplus. The long-range planning of most pipelines is now predicated on the assumption of renewed shortages by 1985. It is therefore revealing to note that while the pipelines are attacking producers for refusing to modify the pricing and take-or-pay provisions on existing new gas contracts, many of them are offering the producers virtually identical terms for gas scheduled for delivery in 1985.

The current gas market does indeed differ significantly from the one five years ago. We no longer have a seller's market; today it's the buyer who has the leverage. This factor alone provides sufficient incentive for producers to renegotiate with the pipelines in good faith. Producers are eagerly seeking markets for their current production in today's shrinking market, but the pipelines already have more gas than they need for the short term. It is a truism that consumers are better off in a buyer's market--provided the market is allowed to work.

Producers and pipelines need one another. Producers may control the supply of natural gas, but pipelines exercise near absolute control over gas markets by virtue of their legislatively-mandated monopoly of the transportation system. Moreover, a producer has one package of gas to sell in a specific producing "province," whereas individual pipelines have access to a large number of suppliers. A large gas producer may have only 40-50 customers. Large pipelines may literally have thousands of suppliers. In a deregulated market, pipelines serving a given province face similar market conditions which would mitigate against wide price disparities in renegotiated contracts. Finally, it would be just plain bad business for producers to stonewall the pipelines if they expect to continue dealing with them in the future.

For those individuals or groups who are concerned about government meddling in private contracts, I would argue that the

Administration's reliance upon "arms length" negotiation to bring the market into balance is preferable to government fiat. There is simply no other rational method to eliminate existing disparities and restore equilibrium.

Keep in mind that many gas contracts were signed many years ago to comply with regulatory requirements that no longer are applicable. The mutual "market-out" and renegotiation provisions contained in the Administration's bill are indeed among its most ingenious features. Those consumer groups who allege that producers will simply turn off the valve unless their terms are met are woefully misinformed about the manner in which we must conduct our business. For example, the lease provisions for producing properties generally prohibit the termination of production except for lack of markets. In short, producers have an obligation to the royalty owners, who own the mineral rights to producing properties, to market the gas. The deliberate cessation of production by a producer for any other reason would violate the producer's contractual obligations to the royalty owners and thereby jeopardize the lease.

The Old Gas Question

A number of critics object to the decontrol of old gas on the grounds that it will precipitate a transfer of considerable wealth to major gas producers. To some critics the term major producers translates as "big oil." For those disposed to think in such simplistic terms, anything that is perceived as benefiting "big oil" is, by definition, bad for everyone else.

These arguments conveniently ignore the fact that downward pressure on new gas prices exerted by decontrolled old gas will force these same producers to relinquish a portion of their present earnings currently derived from new gas sales.

The most outspoken opposition against decontrolling old gas has come from pipelines with access to old gas. While these same pipelines enthusiastically endorse the deregulation of new gas, they adamantly oppose lifting price controls on the 46 cents gas I alluded to in my earlier remarks.

I want to make certain that this Committee understands why the pipelines insist upon retaining price controls on old gas. Their motives are essentially self-serving. The pipelines--not the producer and certainly not the consumer--have benefited by having access to these old gas reserves, particularly in those cases in which the reserves are dedicated exclusively to specific pipelines. Permanent price controls on old gas partially reduces the element of risk for pipelines in planning their future operations.

Moreover, this so-called old gas "cushion" gives those pipelines a powerful competitive advantage in bidding for new supplies against pipelines without a "cushion." The reason that new gas prices have now exceeded market-clearing levels is because the pipelines have used the "cushion" to bid up the price of new supplies. Having secured these new supplies, the pipelines then are free to average the costs of old and new gas to determine their average price to consumers. In order to prevent interruptions in service due to inadequate supplies, those pipelines without access to old gas must pay the inflated new gas price and then pass along the increased costs to their customers. Perhaps the worst feature of the present system is that it forces American consumers to subsidize foreign producers by allowing pipelines to utilize the old gas "cushion" to bid on expensive Mexican, Canadian and Algerian gas.

The arbitrary division of natural gas into old and new categories grossly distorts the gas market, causing wide intra--as well as inter--regional price disparities. Consumers living in neighboring geographic regions are thus paying significantly different prices for the same commodity based largely on whether or not the particular pipeline that serves their region has supplies of old gas. These inequities have been created by government policy, not by market forces. They will not disappear until all gas--old and new--is deregulated so that gas is treated as a single commodity in the marketplace. Failure to decontrol old gas will perpetuate the present price distortions for many years to come.

As I have tried to demonstrate in my remarks, the consumers are not receiving tangible benefits from the regulated low cost producing fields. Instead, the pipelines are exploiting the old gas cushion to enhance their competitive posture in bidding for new domestic supplies, subsidize their purchase of expensive imports, and inflate new gas prices above market-clearing levels, all to the detriment of consumers. Meanwhile, the pipelines are using arguments couched in consumer protection rhetoric to obscure the fact that they--not consumers--are the chief beneficiaries of continued regulation of old gas.

Summary

I would like to conclude by reiterating my strong belief in the phased, orderly decontrol of all natural gas as proposed by the Administration. I believe this course of action is in the best interests of American consumers, the domestic natural gas industry, and, indeed, the nation as a whole. As long as even partial government price controls remain in effect, market distortions will persist. The actual experiences of the decontrolled oil market demonstrate that deregulation is not synonymous with price increases. I believe that the total decontrol of natural gas will work to the advantage of consumers by stimulating competitive pricing, encouraging new exploration and production, making natural gas more competitive with other less environmentally safe energy resources, and displacing high-cost imported gas.

Opposition to the Administration's legislative initiative to decontrol all gas has largely been based on its potential impact on particular vested interests. The Administration's bill, to its credit, seeks to strike a balance among these competing interests. The Administration's approach may not bring about the best of all possible worlds for each of us individually, but it will help ensure a better future for all of us collectively.

Senator NICKLES. Thank you very much.
Mr. Whitworth or Mr. Gaul, whichever.

STATEMENT OF J. BRYAN WHITWORTH, VICE PRESIDENT, GOVERNMENT RELATIONS, PHILLIPS PETROLEUM CO., ACCOMPANIED BY BILL GAUL, MANAGER, LAWS AND REGULATIONS

Mr. WHITWORTH. My name is Bryan Whitworth. I will read the statement on behalf of Phillips Petroleum Co.

I am vice president of Phillips' Government relations organization, and I appreciate the opportunity to appear before this committee, to express on behalf of Phillips a very straightforward position.

Phillips Petroleum Co. favors decontrol of all natural gas and believes that the proposal of President Reagan and Energy Secretary Hodel embodied in Senate bill 615 is an appropriate way to achieve such a decontrol.

This committee has held extensive hearings in Washington, following introduction of S. 615. Most of the witnesses who have appeared before you have agreed that the current Federal natural gas policy embodied in the Natural Gas Policy Act is not working.

Many of the varied interests in our society represented by those witnesses have urged a return to a free market for natural gas. Others have urged changes to the Natural Gas Policy Act by extending even more controls over natural gas markets. Many have stated that they favor decontrol of natural gas, but they want to make various changes to the proposal contained in S. 615.

Phillips Petroleum Co. takes a somewhat different view of S. 615. While technical changes to that bill may, indeed, be appropriate, such concerns are secondary to the basic issue, and that is, is this committee and the Congress willing to put in place the last missing link in our national energy policy? A free market for natural gas.

It is Phillips' position that it is critical for our Nation that we end almost 30 years of Government interference in the natural gas markets as quickly as possible. The best interests of gas producers, gas pipelines, and distribution companies, and most of all gas consumers, will be served only if this Congress expeditiously enacts legislation like S. 615 and abolishes the current unworkable national energy policy embodied in the NGPA and the Fuel Use Act.

In order that Phillips' position may be understood, I would like to take a moment to outline our natural gas activities. Phillips' production during 1982 accounted for an average of 682,000 thousand cubic feet of gas per day in the United States, excluding Alaska.

In addition, Phillips processes much of its own gas and purchases gas from others to extract natural gas liquids. Our purchases of gas from others during 1982 averaged approximately 43 percent more than the gas we produced.

One of my main purposes today is to explain why Phillips believes that decontrol of all natural gas is the only appropriate solution to the very urgent national problems which have resulted from almost 30 years of price controls.

The other is to address some of the areas, such as gas supply and decontrol of old gas, where opponents of decontrol are concentrating public attention through what we consider to be false statements and unsupportable positions.

First, I would like to address the long-term natural gas supply question. Although the present recession, coupled with incremental pricing required by the NGPA and gas use restrictions of the Fuel Use Act, have created a current surplus in deliverable supplies of natural gas, our country has consumed more natural gas in 12 of the past 14 years than gas producers have been able to add to reserves.

There is a pressing need to encourage the consistent, long-term discovery and production of new reserves of natural gas. Only a free market for natural gas can insure a rational supply response to demands for natural gas.

We have not had that free market for 30 years. In fact, since natural gas became a major energy commodity, we have never had the appropriate economic stimulus for finding and developing gas that only a true free market can produce. That's the reason that domestic reserves to production ratio, exclusive of Alaska, has steadily declined from 14.6 to 1 in 1968 to 9.11 to 1 at yearend 1981.

Prior to enactment of NGPA in 1978, Federal controls kept the price of natural gas so low relative to competing fuels such as oil, that most natural gas discoveries were simply the unintended result of the search for oil. Much gas, as you know, is produced in association with oil.

Meanwhile, absurdly low gas prices encouraged consumers to waste gas. By the severe winter of 1976 and 1977, the Nation experienced widespread deliverability shortages of gas in interstate markets. Those shortages were mistakenly interpreted by Congress as a sure sign that the Nation was running out of gas. The result was the Natural Gas Policy Act.

Under the NGPA, high controlled prices and even unregulated pricing is allowed for certain categories of gas. Unfortunately, those high prices are allowed for the most difficult and costly reserves to find and develop. As a result, producers have been encouraged to find these least accessible, most costly sources of gas, while much more readily available, known reserves are bypassed. This is exactly opposite of how a free market would work.

There are those who point to significant discoveries of deep gas found in western Oklahoma and elsewhere as proof that the NGPA is working to stimulate new supplies of gas. And it has worked. The only problem is that those very inaccessible, costly reserves are not what the consumer is demanding today; and, thus, they should not be the focus, the primary focus of exploration. These reserves should be developed and produced only as the market dictates, and should not be subsidized by holding other reserves at substantially below market levels.

In fact, the decontrol of gas discovered below 15,000 feet has in many respects worked a disservice upon the American public. Prices as high as $10 per thousand cubic foot have been paid for such gas. That's the equivalent of $58 per barrel for oil, an uncontrolled commodity now selling in the range of $29 to $30 per barrel. Critics of decontrol point to these few $10 thousand cubic foot sales of gas as evidence of free market price levels. Such prices simply do not reflect the marketplace.

Controlled gas, particularly the more than 40 percent of our current supplies held to a price around $50 per thousand cubic feet. That's been subsidizing the $10 gas.

Those prices for deep gas are not market prices. Suffice it to say that there has been extensive drilling for oil over the years at depths below 15,000 feet, while the market price for oil was way below the equivalent of those $7 to $10 per thousand cubic feet levels that some gas producers receive today.

Let's look for a minute at the potential for discovering new reserves of natural gas in Oklahoma. The Potential Gas Committee of the Colorado School of Mines is the acknowledged authority regarding that potential. Potential reserves are estimated by using state-of-the-art geological premises. Estimates are divided into three categories: probable, possible, and speculative.

In the last published report, the Potential Gas Committee estimated that the geological provinces within Kansas, Oklahoma, and the Texas panhandle contain as yet undiscovered probable reserves of natural gas of 18 trillion cubic feet at depths above 15,000 feet.

Probable reserves below 15,000 feet are estimated at 9 trillion cubic feet.

Shallower possible reserves are estimated at 27 trillion cubic feet, while deep possible reserves are estimated at 39 trillion cubic feet.

Only in the last, least probable category, that of speculative reserves, do the committee's estimates for deep gas vastly exceed those for shallower gas.

We think the message is clear. A decontrolled, free market for natural gas will stimulate the search for these probable and possible reserves in shallower formations. The gas production industry in Oklahoma and elsewhere will rationally search for and develop the most readily available new supplies of natural gas. Cheaper gas will be developed first, to the obvious benefit of consumers, while the gas-producing industry has a substantial base for continued healthy operations.

Turning now to the issue of decontrol of old gas, some consumer groups and pipeline companies and some distribution companies continue to oppose the decontrol of gas discovered prior to 1977. They say that decontrol of old gas will produce no additional supplies, and that it will discourage exploration for new gas.

Phillips rejects these positions. It is our view that they are simply wrong.

Decontrol of all natural gas, old and new, will prevent the premature abandonment of mature, producing fields, and encourage their extension and further development. Moreover, market-determined prices for all gas, including old gas, will generate not only additional gas, but also capital badly needed to reinvest in gas exploration and development.

This committee, Senator Nickles, already has before it a model prepared by Dr. Erickson of North Carolina State University, which predicts that decontrol of old gas will result in additional production from mature reservoirs in this decade of 4.5 trillion cubic feet, and additional reserves of 5.5 trillion cubic feet.

That will not happen if the NGPA is left in place, or, worse, if the Congress adopts proposals to recontrol and further control gas, as some of the consuming groups advocate.

The continued control of old gas will not protect the consumer from higher prices, just as it does not do so today under the NGPA. It only subsidizes higher than necessary new gas prices, and fosters regional price discriminations resulting from the nature of a particular pipeline's supply. Interstate pipelines with a larger supply of old gas, controlled at low levels, will continue to maintain a competitive advantage over intrastate and other pipelines.

Finally, turning to incremental pricing and fuel use restrictions, S. 615 wisely calls for repeal of the incremental pricing provisions of the NGPA and gas use prohibitions and restrictions of the Fuel Use Act.

If a free market is to work by balancing supply and demand at reasonable rates, then the market must be truly free. This calls for market prices and availability of gas to all classes of customers, industrial, residential and commercial.

The industrial sector of our economy is traditionally the largest single consumer of natural gas. Under the NGPA, the most expensive categories of gas are required to be sold to industrial customers before any of the most expensive gas is rolled in with remaining gas for ultimate sale to residential and commercial users.

The idea was to shield residential and small business users from rising gas prices. It has not worked. As a result of incremental pricing, many industrial users have switched from natural gas to cheaper alternatives, such as fuel oil or coal.

The recession has also reduced industrial demand for gas. Because of this fuel switching and reduced demand, pipelines and distribution companies are transporting and distributing sharply reduced volumes of gas to industrial customers.

While part of the increased cost for natural gas resulting from higher prices under the NGPA, the most significant factor contributing to the increased cost of natural gas is the allocation of pipeline and distribution companies' fixed costs, including return on investment, over significantly fewer units of gas sold.

Like incremental pricing, the prohibition of the Fuel Use Act also contributes to a decline in demand for natural gas. Use of gas in new industrial boilers is, in many cases, prohibited, thus, further restricting the market for natural gas, while simultaneously raising unit costs to the customers.

Thus, repeal of both incremental pricing and industrial use prohibitions are an essential part of decontrol. By expanding supplies of natural gas, as well as the market for gas, consumers will enjoy at the lowest unit cost the benefit of a great natural resource with which the State and Nation are blessed.

In closing, Senator, I want to reiterate our view that total decontrol of natural gas supply and demand is the only answer to our current natural gas problems. Producers, pipelines, distribution companies, and consumers will benefit. Whatever short-term inconveniences may arise between the enactment of S. 615 and the beginning of 1986 are wel worth the long-term benefit to our Nation resulting from a free market system.

Conversely, Phillips opposes those proposals also before Congress which would freeze prices, roll back prices, and continue and add to the insanity of the NGPA. The free market is the only solution to gas problems which has not been tried during the last 30 years; but it is the only one which will work, as is so amply demonstrated by the market for oil and other commodities.

Again, Mr. Chairman, I thank you for holding these hearings in Oklahoma. I'll be happy to answer any questions for you.

[The prepared statement of Mr. Whitworth follows:]

Testimony of

J. BRYAN WHITWORTH

of

PHILLIPS PETROLEUM COMPANY

Before The

COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

In Field Hearings at

Tulsa, Oklahoma

March 28, 1983

MR. CHAIRMAN:

My name is Bryan Whitworth. I am Vice President Government Relations of Phillips Petroleum Company and reside in Bartlesville, Oklahoma, where Phillips was founded and has been continuously headquartered since 1917.

I appreciate the opportunity to appear before this committee, Mr. Chairman, to express on behalf of Phillips a very straight-forward position: Phillips Petroleum Company favors decontrol of all natural gas and believes that the proposal of President Reagan and Energy Secretary Hodel embodied in S.615 is an appropriate way to achieve decontrol.

This committee has held extensive hearings in Washington following introduction of S.615 by Senator McClure. Most of the witnesses who have appeared before you have agreed that the current federal natural gas policy embodied in the Natural Gas Policy Act is not working. Many of the varied interests in our society represented by those witnesses have urged a return to a free market for natural gas. Others have urged changes to the Natural Gas Policy Act by extending even more controls over natural gas markets. Many have stated that they favor decontrol of natural gas, but they want to change various provisions of S.615.

We at Phillips take a somewhat different view of S.615. While technical changes to S.615 may indeed be appropriate, such concerns are secondary to the basic issue:

> Is this committee and the Congress willing to put in place the last missing link in our national energy policy, a free market for natural gas?

It is Phillips' position that it is critical for our nation that we end almost 30 years of government interference in the natural gas markets as quickly as possible. The best interests of gas producers, gas pipelines and distribution companies, and, most of all, gas consumers will be served only if this Congress expeditiously enacts legislation like S.615 and abolishes the current unworkable national policy embodied in the NGPA and the Fuel Use Act.

In order that Phillips' position as a producer may be understood, I want to take just a minute to outline the natural gas activities of my company. Phillips production interests during 1982 accounted for an average of 682,000 MCF of gas per day in the United States excluding Alaska, of which 62,000 MCF per day was produced in Oklahoma. In addition, Phillips processes much of its own gas and additional gas purchased from others to extract natural gas liquids (propane, butane, ethane, etc.) prior to the sale or resale of the residue gas to natural gas pipeline companies. Our purchases of gas from others during 1982 averaged 1,181,000 MCF per day, again exclusive of Alaska, approximately 43% more than we produce. The company is a substantial producer of gas of which a significant amount is so-called old gas discovered before April, 1977.

One of my purposes today is to explain why Phillips believes that decontrol of natural gas is the only appropriate solution to the very urgent national problems which have resulted from almost 30 years of price controls — controls made even more onerous by the Natural Gas Policy Act. The other is to address some of the areas — such as gas supply and decontrol of old gas — where opponents of decontrol are concentrating public attention through false statements and unsupportable positions.

Long-Term Natural Gas Supplies

Although the present recession, coupled with incremental pricing required by the NGPA and gas use restrictions of the Fuel Use Act, have created a current surplus in deliverable supplies of natural gas, our country has consumed more natural gas in 12 of the past 14 years than gas producers have been able to add to reserves. There is a pressing need to encourage the consistent, long-term discovery and development of new reserves of natural gas. Only a free market for natural gas can ensure a rational supply response to demands for natural gas. We have not had that free market for 30 years, Mr. Chairman. In fact, since natural gas became a major energy commodity, we've never had the appropriate economic stimulus for finding and developing gas that only a true market can give. That's the reason that the domestic reserves to production ratio, exclusive of Alaska, has steadily declined from 14.6:1 in 1968 to 9.11:1 at yearend 1981.

Prior to enactment of the NGPA in 1978, federal controls kept the price of natural gas so low relative to competing fuels, such as oil, that most natural gas discoveries were simply the unintended result of the search for oil. Much gas, as you know, is produced in association with oil.

Meanwhile, absurdly low gas prices encouraged consumers to waste gas. By the severe winter of 1976-77, the nation experienced widespread deliverability shortages of gas in interstate markets. Those shortages were mistakenly interpreted by Congress as a sure sign that the nation was running out of gas. The result was the Natural Gas Policy Act.

Under the NGPA, high controlled prices and even unregulated pricing is allowed for certain categories of gas. Unfortunately, those high prices are allowed for the most difficult and costly reserves to find and develop. As a result, producers have been encouraged to find those least accessible, most costly sources of gas while much more readily available known and potential reserves are bypassed. That is exactly opposite of how a free market works.

Yes, Mr. Chairman, there are those who point to significant discoveries of deep gas found in western Oklahoma and elsewhere as proof that the NGPA is working to stimulate new supplies of gas. And it has, Mr. Chairman. The only problem is that those very inaccessible, costly reserves are not what the consumer is demanding today and thus they should not be the primary focus of exploration. These reserves should be developed and produced only as the market dictates and should not be subsidized by holding other reserves at substantially below market levels.

In fact, the decontrol of gas discovered below 15,000 feet has in many respects worked a disservice upon the American public. Prices as high as $10 per MCF have been paid for such gas. That's the equivalent of $58 per barrel for oil — an uncontrolled commodity now selling in the neighborhood of $29 per barrel. Critics of decontrol point to those few $10/MCF sales of gas as evidence of free market price levels.

But that simply isn't true. Controlled gas — particularly the more than 40% of our current supplies held to a price around 50 cents per MCF (that's the equivalent of oil at $2.90 per barrel) — has been subsidizing that $10 gas. Those prices for deep gas are not market prices. Suffice it to say that there has been extensive drilling for oil over the years at depths below 15,000 feet when the market price for oil was way below the equivalent of those $7 - $10 per MCF levels that some gas producers say they need.

Let's look for a minute at the potential for discovering new reserves of natural gas in Oklahoma. The Potential Gas Committee of the Colorado School of Mines is the acknowledged authority regarding that potential. Potential reserves are estimated by using state-of-the-art geological premises. Estimates are subdivided into three categories:

(1) probable reserves, (2) possible reserves and (3) speculative reserves. In its latest pubished report, the Potential Gas Committee estimates that the geological provinces within Kansas, Oklahoma and the Texas Panhandle contain as yet undiscovered probable reserves of natural gas of 18 trillion cubic feet at depths above 15,000 feet. Probable reserves below 15,000 feet are estimated at nine trillion cubic feet. Shallower possible reserves are estimated at 27 trillion cubic feet while deep possible reserves are estimated at 39 trillion cubic feet. Only in the last, least probable category, that of speculative reserves, do the committee's estimates for deep gas (37 trillion cubic feet) vastly exceed those for shallower gas (five trillion cubic feet).

We think the message is clear. A decontrolled, free market for natural gas will stimulate the search for those probable and possible reserves in shallower formations. The gas production industry in Oklahoma and elsewhere will rationally search for and develop the most readily available new supplies. Cheaper gas will be developed first to the obvious benefit of consumers while the gas producing industry has a substantial base for continued healthy operations.

Decontrol of Old Gas

The so-called "consumer" groups and some pipeline companies and some distribution companies continue to oppose the decontrol of gas discovered prior to 1977. They say that decontrol of old gas will produce no additional supplies and that it will discourage exploration for new gas.

Phillips rejects those positions; they are simply wrong. Decontrol of all natural gas — old and new — will prevent the premature abandonment of mature producing fields and encourage their extension and further development. Moreover, market-determined prices for all gas, including old gas, will generate not only additional gas but also capital badly needed to reinvest in gas exploration and development. This committeee already has before it a model prepared by Dr. Erickson of North Carolina State University which predicts that decontrol of old gas will result in additional production from mature reservoirs in this decade of 4.5 trillion cubic feet and additional reserves of 5.5 trillion cubic feet. That will not happen if the NGPA is left in place or, worse, if the Congress adopts proposals to recontrol and further control gas as some of the consumer groups advocate.

The continued control of old gas will not protect the consumer from higher prices, just as it does not do so today under the NGPA. It only subsidizes higher than necessary new gas prices and fosters regional prices discriminations resulting from the nature of a particular pipeline's supply. Interstate pipelines, with a larger supply of old gas controlled at low levels, would continue to maintain a competitive advantage over intrastate and other pipelines.

Incremental Pricing and Fuel Use Restrictions

S.615 wisely calls for repeal of the incremental pricing provisions of the NGPA and gas use prohibitions and restrictions of the Fuel Use Act. If a free market is to work by balancing supply and demand at reasonable prices, then that market must be truly free. This calls for market prices and availability of gas to all classes of consumers — industrial, residential and commercial.

The industrial sector of our economy is traditionally the largest single consumer of natural gas. Under the NGPA, the most expensive categories of gas are required to be sold to industrial customers before any of the most expensive gas is rolled-in with remaining gas for ultimate sale to residential and commercial users. The idea was to shield residential and small business users from rising gas prices. Has it worked? Absolutely not! As a result of incremental pricing, many industrial users have switched from natural gas to cheaper alternatives such as fuel oil or coal. The recession has also reduced industrial demand for gas. Because of this fuel switching and reduced demand, pipeline and distribution companies are transporting and distributing sharply reduced volumes of gas to industrial consumers. While part of the increased cost for natural gas results from higher prices under the NGPA, the most significant factor contributing to the increased cost of natural gas is the allocation of pipeline and distribution companies' fixed costs, including return on investment, over significantly fewer units of gas sold.

Like incremental pricing, the prohibitions of the Fuel Use Act also contribute to a decline in demand for natural gas. Use of gas in new industrial boilers is in many cases prohibited, thus further reducing the market for natural gas while simultaneously raising unit costs to the consumer.

Thus repeal of both incremental pricing and industrial use prohibitions are an essential part of decontrol. By expanding supplies of natural gas, as well as the market for gas, consumers will enjoy at the lowest unit cost the benefit of a great natural resource with which the state and nation are blessed.

Conclusion

In closing, Mr. Chairman, I want to reiterate our view that total decontrol of natural gas supply and demand is the only answer to our current natural gas problems. Producers, pipelines, distribution companies and consumers will benefit. Whatever short-term inconveniences may arise between enactment of S.615 and the beginning of 1986 are well worth the long-term benefit to one nation resulting from a free market system.

Conversely, Phillips opposes those proposals also before Congress which would freeze prices, roll-back prices and continue and add to the insanity of the NGPA. The free market is the only solution to gas problems which hasn't been tried during the past 30 years. But it's the only one which will work as is so amply demonstrated by the market for oil and other commodities.

Again, Mr. Chairman, I thank you for holding these important hearings in Oklahoma. I'll be happy to try to answer any questions the committee may have.

Senator NICKLES. Thank you very much, Mr. Whitworth.

A couple of questions. You mentioned a study that was done, I think, by Colorado School of Mines.

Mr. WHITWORTH. Yes, sir.

Senator NICKLES. Could you give us a copy of that study?

Mr. WHITWORTH. Yes. We can obtain that information for you, Senator.

Senator NICKLES. That would be appreciated, and we could add that as to the record; as I think it's of interest.

I guess I will ask you this question: You do feel if we did deregulate all gas, including the old gas, that we would add substantially to old gas reserves?

Mr. WHITWORTH. It is our view that we would. As long as you are going to continue to have controls on old gas, we feel that there would be premature abandonment of many of those fields, with reserves that could be produced, but the economics just do not justify.

Under decontrol, obviously supply is something that we must consider for the future; we feel that much of that gas would continue to be produced.

Senator NICKLES. If we also decontrolled old, do you feel like we would not only eliminate the premature abandonment of those wells, but, also, be increasing the amount of production from the old gas categories or the cheaper gas categories, the shallow wells, the older wells, the enhancement of those wells, production of those wells, to where you would be increasing the mix?

Mr. WHITWORTH. I think your statement made a good argument, that it could be to the consumer's benefit to increase the production of the old, that being cheaper gas in many respects to produce, that increasing that mix in relationship to possibly the deeper, that the consumers might well benefit.

We would see two benefits, Senator. One would be that the additional gas produced would have an averaging-out effect on the price of gas, keeping it at a lower level; plus, we would think there would be greater volumes of gas available to the consuming public.

Both of those, obviously, are long-term interests.

Senator NICKLES. Is your statement made, from the context where many might possibly come back and say:

> Well, Phillips Petroleum or possibly Cities Service, might make a statement like that, because it would be self-serving, because they have large quantities of old gas; and here I am, I am an independent producer and I have no old gas, but I have some quantities of deep or high-cost gas.

So saying that this would be to your advantage and to their economic disadvantage.

Your arguments, are they correct, or are you making it from a philosophical argument that you feel like the marketplace should be——

Mr. WHITWORTH. Well, as far as Phillips is concerned, we have both old gas as well as deep gas; so we are looking at it from both viewpoints.

In addition, I think I stated that initially in my statement that we are also—purchase more gas than we produce. So we are both a purchaser and old gas and a deep gas producer, so that perspective probably keeps us from being biased one way or the other.

But I think that our view is that, philosophically, the marketplace just has not worked under existing Government regulations, irrespective of whether decontrol is of benefit to us as a company, which we have not really determined. We think it's obviously, in the long-term, best interest of the Nation.

We are in it not for what we can make today or tomorrow or how much gas we can provide in the short term; but we are in it for the long-term benefit. And any detriment that we have to experience in the next year or two or three, we think is justified when we look at the long-term benefits that would be derived from decontrol.

Senator NICKLES. Mr. Waidelich?

Mr. WAIDELICH. Senator, I would like to say that whether you are a pipeline, a producer, a major producer or a small producer, we all take our signals from the consumer.

And it seems to me the consumer is saying to us that the price of the gas that is being placed on the market today is too high; it's been going up too fast; and that there are competing fuels that, in some cases, make gas not competitive.

So what that tells the producer—I will let the pipelines speak for themselves—but what it tells the producer is that we should be going out and finding gas that can be brought to market, for example, at $2.50 a thousand or $3 a thousand or $3.25 a thousand; but we should not be looking for gas right now at $5 or $10 a thousand.

We can in future years. But what we need to do is to exhaust those sources of gas that can be brought to market at around $3 a thousand. We can benefit from that as a producer. The pipeline can benefit from it by expanding its sales. And, certainly, the consumer can benefit by it.

Senator NICKLES. Do you think there—can I ask you the same question I asked earlier? Do you think there would be a significant increase in the amount of reserves or the quantity of gas that would be in the old gas or the cheaper gas category?

Mr. WAIDELICH. Yes, I do, for some of the same reasons that Bryan has mentioned.

I would also say, as an example, when price of oil was decontrolled, many of the old fields were examined carefully, and much in-field drilling was done. Drilled more wells in the same old field, and removed or produced the oil more efficiently.

We at the same time expanded the reserves in those fields.

I think the same thing can be done in the natural gasfields. And I think we ought to be doing that before we look for a gas that can be brought to market for no less than $10 or $12 a thousand.

I think the market is saying they can't absorb that kind of price.

Mr. GAUL. Senator, I might add one point to that.

One of the ways to bring back at least part of the market is to lower the price of gas, that the gas prices are low enough, the market will come back; and more of the old gas that can be produced, the lower the average price is going to be and the more the market is going to come back.

This spreads out the unit cost of the transmission and distribution companies over a greater volume of gas, which in turn tends to lower the price to the consumer.

Senator NICKLES. I must tell you, Mr. Waidelich, that when I read your statement or heard your statement, your paragraph said that you totally endorsed the package, I heard countless number of witnesses, and I have never heard that before.

The majority of the people that testify, touch on the 18-point proposal, the Secretary Hodel commonly refers to it, and like 14 of them and have strong reservations about 4. And that includes everybody from producers, pipelines, to consumer groups. And so it's kind of interesting; so you may be the first to take that giant step.

Mr. WAIDELICH. Well, Senator, I think in an issue like this, where so many people are affected, and there are so many divergent views, that you've got to take a balanced approach such as the Congress did on social security, in order to find a solution.

And I think here that there are—we can dissect the President's proposal and find many things that we would like to see improved. But we must recognize that there are many constituencies that have to be served by this bill; and I feel that what the President has put out is fair to all parties, and that the producers ought to recognize that there has got to be a little give here and there on their part, as should the pipelines and consumers.

Senator NICKLES. I might ask a couple of other questions. One relating to the gas cap, there's been a lot of discussion on it today; and all of you are aware there's been a lot of discussion on it in Washington, D.C., what the effect of the gas cap would be; whether or not, if it could or would be a significant rollback for producers at this time.

Do any of you have any comments?

Some have stated that possibly the gas cap should be determined on new contracts only, and not on renegotiated contracts. Do you have any thoughts on that?

Mr. WHITWORTH. Senator, I might address that initially.

We have considered the gas cap. And I think it's one area in which there is a disagreement among people within the industry.

However, we have looked at the bill as a package, and, admittedly, if we had drafted the bill, our company had drafted the bill, we would have drafted it somewhat differently.

But we recognize that it's a bill that has to be realistic, taking into consideration all of the various segments that are affected by natural gas.

I guess on the cap, we would probably argue as to what should or should not be included in it. But from our standpoint, we are willing to take it as a package; accept the good with the bad, because we think that the ultimate objective of obtaining a free market is in the best interest of all the segments affected by natural gas. And so we are willing to take some short-term penalties that might be experienced as a result of the cap not being exactly the way we would want it; but those short-term penalties, we think, are insignificant when you consider the long-term benefits.

Senator NICKLES. Could I move that over and touch on the contract sanctity and the provision that would allow—have that—that window for one party or the other party to opt out of the contract.

Many have made a very strong statement, I believe, which I have a very strong tendency to support, that contracts should be allowed to run their course, and given if you had two parties voluntarily renegotiating the contract, that's fine; but the contract shouldn't be abrogated by an action of Congress.

Would you care to comment on that proposal?

Mr. WAIDELICH. Senator, I guess under ideal conditions, or maybe I should say under most normal conditions, I would certainly agree with you. But it seems to me here that as a result of past legislation, contracts have been generated which today are really out of date and are causing serious distortions in the marketplace, both old and new contracts. And it would seem to me that the best way out of this would be to allow the pipelines and the producers and the consumers to get together and renegotiate these contracts.

To me that's much more preferred than to have it done by Government fiat.

I say that the producers can—that that is the— the consumers can participate in this renegotiation, too, because I think they are, when they send signals back to the pipeline and to the producer that we don't want your gas; we have something cheaper to burn; or we don't—we can't afford your gas; we are going to turn our thermostats down to 60 degrees. I think they are sending a very strong message out, and in that way they can participate, as well as can we as a producer.

Just broadening the answer a little further, and talking about the price cap, most of the producers today that have old gas also have new gas contracts. And if we are opening up contracts across the board, we certainly are going to be negotiating with pipelines to not only have some of those old gas contracts with us, but they have new contracts. And I feel that in that renegotiation we are going to be protecting ourselves and they are going to be—they, the pipelines, are going to be protecting themselves.

I think that the gas cap can serve well during the interim period, to prevent prices from getting out of line, both on the high side and the low side. So, while there are some possibilities of prices coming down to the consumer, and coming down rather dramatically—and by that I mean maybe 25 to 35 to 40 cents a Mcf—if that's the effect of the renegotiation, then I say so be it. We will have to live with those lower prices.

The pipelines will presumably gain some additional sales, as a result of the lower prices. And maybe we will sell a little more gas in a few months.

So I don't fear the fact that the gas cap could actually result in some lower gas prices. I think that may be healthy for the economy and the consumer and ultimately be helpful to the producer.

Senator NICKLES. Some have indicated possibly that maybe the abrogation of contracts should only be for the new contracts, not for the old contracts.

Do you have any thoughts on that?

Mr. WAIDELICH. Yes, I have some very strong thoughts. I think that if we are going to renegotiate contracts, we ought to do so on both old and new gas.

The consumer today is not benefiting from the old gas contracts.

Senator NICKLES. Could you elaborate on that a little bit further?

Mr. WAIDELICH. Yes.

The pipeline takes of old gas have been going down rather dramatically. I would cite the biggest gasfield in the United States, the Hugoton Field.

At recent market demand hearings in Wichita, I believe that the demand on that field was set at some 80 billion cubic feet over the next 6 months. And that's about one-third the producing capacity of the field.

And the reason for that is that pipelines, because they are in this straitjacket with many of their new contracts that have take or pay clauses, are required to take the new gas, which is the high-priced gas, in preference to the old gas.

So I think we need to loosen the market; not only "loosen" the market, we need to open it up and allow that old gas to flow; and if in renegotiation the prices go up, so be it. That's the cheapest gas to produce anyway today.

Senator NICKLES. You think that would increase—taking the Hugoton Field, you think that would increase the production of that field?

Mr. WAIDELICH. Absolutely.

Senator NICKLES. And right now you mentioned—right now, out of the Hugoton Field, they are only producing about a third of capacity, or——

Mr. WAIDELICH. Of the productive capacity; that's correct.

Senator NICKLES. And that's the old 104 gas, the cheap gas. And so they are shutting in that gas and supplementing that with either high-cost gas——

Mr. WAIDELICH. That's right, that's right.

And they are losing sales as a result.

Most of the prices in the Hugoton Field are—they vary from 29 cents a thousand cubic foot, which is the minimum mandated under NGPA, or 46 cents a thousand cubic foot. But that gas is not benefiting the producer. It's being kept in the ground.

Senator NICKLES. Well, most of the members of the Kansas delegation that I am familiar with have been advocating maintaining the price controls on old gas. Is having the price controls on 104 gas on the Hugoton Field, is that helping the consumer that might be tied to the pipelines, that—including Cities Service gas, which I know that you are familiar with, and the rest of the companies that produce and ship out of the Hugoton Field, is that old gas really benefiting the customers on the other end of the pipeline?

Mr. WAIDELICH. I don't think it has.

You know, I think the old gas prices at 46 cents a million have merely created a cost vacuum which other high-priced gas has rushed in to fill the void; so that the consumer today is really paying more for his gas than he should be. And this is why I feel very strongly that under a decontrol mode such as the President is recommending, we are going to see gas prices fall. I don't think they will fall a lot, but I think they will fall some. And I think this will encourage the producers to go out and find the cheaper gas.

Senator NICKLES. So you are going to contradict some statements that we have heard earlier, that if we decontrolled that old gas, that Hugoton Gas and other gas, that you think that that will actually hep consumers, because the prices would then begin to fall, whereas if we keep it under controls, that cushion, as you said, that void would continue to be filled?

Mr. WAIDELICH. That's right.

Well, I think we have to keep in mind what the marketplace is doing. The marketplace is using less and less gas, because thee price of gas is going up, and going up too rapidly.

If we can bring back into productive capacity, full capacity, many of the old fields in the United States, even though the price of that gas may go up, the capacity of those fields can be expanded. And I believe what we do in that kind of a scenario is provide more gas at probably cheaper prices for a longer period of time in the future, so that we can build our markets. The pipelines will be handling more gas. Their unit costs will be going down. And the consumer will be benefiting, and so will the producer.

Senator NICKLES. One additional question. This will be for anybody on the panel?

Many pilelines have been complaining about the fact that these very large and expensive take or pays were thrust on them in the period of shortage.

Is that an accurate representation of what has actually happened in contract negotiations?

Mr. WHITWORTH. Senator, I think the thing that needs to be kept in mind is that the take or pay contracts are nothing new. They have been in existence for many, many years.

Many of those provisions arose as a result of the necessity during the winter of 1976 and 1977, to encourage producers to go and find new supplies of natural gas.

At that time it was obviously very expensive to find new gas; and once those producers began to seek the various reserves, then the pipelines desire to tie up those reserves for long periods of time.

The take or pay came about as a result of reaction to the pipelines' needs to have reserve commitments for 15, 20, 30 years, as well as the producer's need to be insured that their bank borrowings, their financing would be covered, in the event the demand began to drop off.

Now, obviously, there have been situations where some of the take or pay provisions have created some hardships in the marketplace. I think in that instance that there have been statements in the papers and before various Senate committees that companies have undertaken to renegotiate those contracts.

I know that Phillips Petroleum Co. has undertaken to, and have actually renegotiated contracts with a certain pipeline in which it was determined that the take or pay was creating an economic hardship, and that provision was changed.

Other companies have done the same thing. So I think the answer is, yes, there have been instances where those provisions have created economic hardships. And I think that in many of those instances, you would find that those contracts have been renegotiated or are in the process of being renegotiated.

Senator NICKLES. Mr. Waidelich.

Mr. WAIDELICH. Senator, your question, I think, you used the word "thrust," the pipelines were thrust into a situation where maybe they felt they had to enter into contracts with take or pay clauses.

And I recognize that there are some pipeline folks in the audience, and I am not pinpointing any particular pipeline, except to say that even today there are some pipelines looking out into the future and recognizing that the needs for natural gas are going to grow in that period beyond 1985, who are today offering to enter into contracts with take or pay clauses. And that's in the kind of surplus gas market we have today.

So I would say to you that there are periods of time when even in a surplus, some folks are offering to enter into a take or pay contract. That would seem a little bit inconsistent with some of those same pipelines wanting to renegotiate some of the old contracts.

Senator NICKLES. Were they coupled with some market-out provisions?

Mr. WAIDELICH. Actually, it seems to me that what we all need is to exercise some self-discipline in our negotiations.

We can sell gas at too low a price and make a bad deal. And I believe that the pipeline can enter into a contract at either too high a price or with restrictive clauses that later hurt him in his dealings with the consumer.

And we all have to be careful not to enter into those bad contracts. And I don't think we should hide under a set of rules or legislation which ultimately hurts the consumer.

Senator NICKLES. How cumbersome—this is just kind of a final question. How cumbersome is it to operate today under NGPA with 28 different price categories and the dates and the levels, et cetera?

Mr. GAUL. It's very, very difficult. And it creates a lot of problems, and sort of tying in with one of your earlier questions, almost every contract in existence today was negotiated during a period of time when there was Federal regulation involved.

Now, as to the question as to whether under the administration's bill the parties should be—either party, the buyer or the seller—should be permitted to renegotiate, it seems to me in that environment and considering that the market distortions have been created by Federal regulation, the fact that the contracts were all negotiated under Federal regulation, that it is only equitable and the fastest way to get to a free market situation is to renegotiate—is to permit each party to, either party, to renegotiate those contracts in that environment, the deregulated market.

The problems are not getting any better with respect to trying to work under NGPA. In fact, they get more complex all the time.

I don't know of any better time, really, than now to eliminate those type of controls.

Senator NICKLES. Gentlemen, we appreciate very much your cooperation, assistance, and expertise that you have given us on this decontrol challenge that we have before us. It is very much appreciated.

Incidentally, we have in the back of the room a signup sheet for individuals that might be interested in further correspondence on the deregulation issue; or if you might be interested in a copy of the hearing record, we will be mailing those out probably in 6 to 8 weeks.

If there's other individuals who wish to supplement the statements that were made today, we would also appreciate your giving those supplements to us.

And I might, again, point out to our individuals that we may have additional questions that we might wish to submit to you to complete the record.

If there's other people who wish to have a copy of the record, you might visit today with Mr. Frank Peterson, who is our reporter for the day.

And, Mr. Peterson, we appreciate your assistance today, as well as the committee staff.

We will have a second day of hearings in Oklahoma City tomorrow morning to wrap up our field hearings on natural gas deregulation.

This committee meeting is recessed. Thank you very much.

[Whereupon, the committee recessed, to reconvene, Tuesday, March 29, 1983, in Oklahoma City, Okla., at 10 a.m.]

[Subsequent to the hearing Phillips Petroleum Co., submitted the following:]

cc. - J. Bryan Whitworth
D. R. Duncan

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA 74004 918 661-6600

GOVERNMENT RELATIONS

March 31, 1983

Mr. Howard Useem
Committee on Energy and
Natural Resources
United States Senate
3106 Dirksen Senate Office Building
Washington, D. C. 20510

Dear Mr. Useem:

At the request of Senator Nickles in connection with the testimony of J. Bryan Whitworth of Phillips Petroleum Company at the committee's field hearing in Tulsa on March 28, 1983, and pursuant to your instructions, I forward herewith the following:

(1) Potential Supply of Natural Gas In the United States (as of December 31, 1980), Potential Gas Committee (Potential Gas Agency), Colorado School of Mines.

(2) News release of Potential Gas Committee/Colorado School of Mines of February 28, 1983 announcing the forthcoming release in June 1983 of the biennial sequel to (1) above.

Mr. Whitworth's written statement submitted to the committee on March 28 discusses potential gas reserves (probable, possible and speculative) in Oklahoma, Kansas and the Texas Panhandle. The estimates set forth in his written statement are drawn from Table 11 on Page 30 of the Potential Gas Committee report relating to Area J-North. Texas Railroad Commission District 10 is essentially coextensive with the Texas Panhandle.

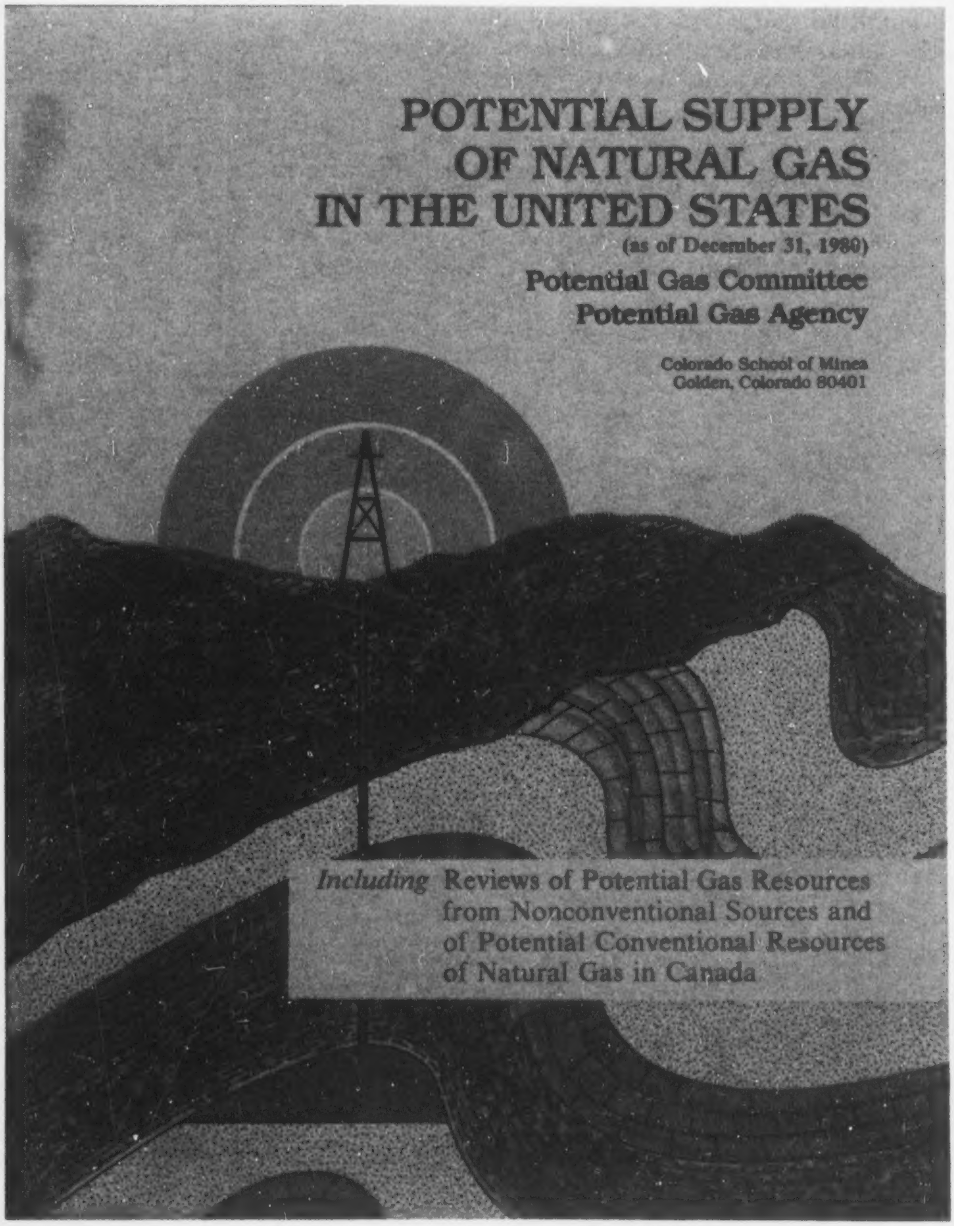
If we may furnish further information, please advise.

Very truly yours,

P. J. Schwartz
Director, Government
Policy

PJS/ct

Enclosures



POTENTIAL SUPPLY OF NATURAL GAS IN THE UNITED STATES

(as of December 31, 1980)

Potential Gas Committee
Potential Gas Agency

Colorado School of Mines
Golden, Colorado 80401

Including Reviews of Potential Gas Resources from Nonconventional Sources and of Potential Conventional Resources of Natural Gas in Canada

The Potential Gas Committee comprises volunteer members from the natural gas industry, government agencies, and academic institutions who are concerned with natural gas resources.

The Committee functions independently but with the guidance and assistance of the Potential Gas Agency of the Colorado School of Mines. The Potential Gas Agency is supported by the American Gas Association.

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POTENTIAL SUPPLY OF NATURAL GAS IN THE UNITED STATES

(as of December 31, 1980)

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Report of the Potential Gas Agency

Harry C. Kent, Director

including a review of

Potential Gas Resources from Nonconventional Sources

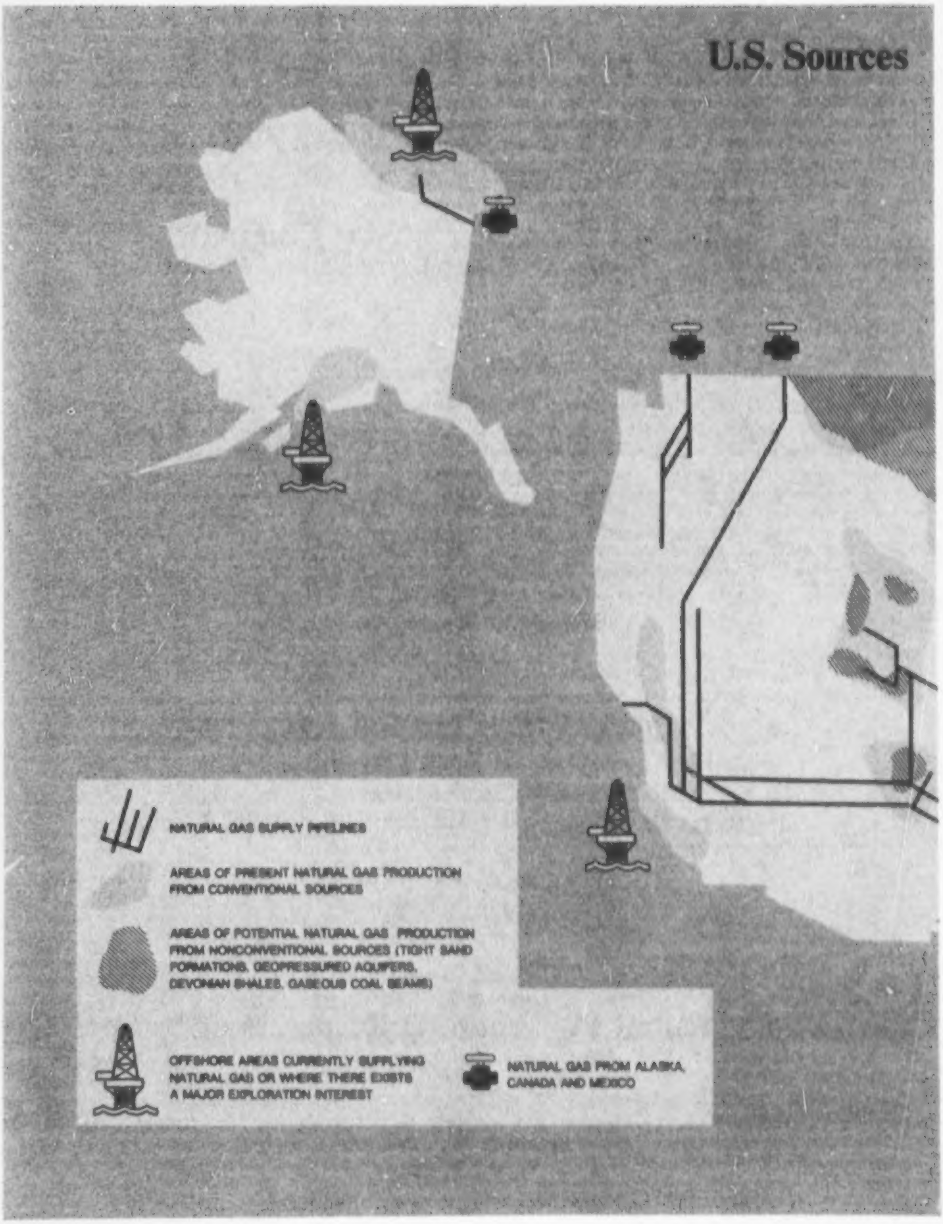
James C. Donaldson
James J. Emme
Harry C. Kent

Review of Potential Conventional Resources of Natural Gas in Canada

Donald W. Axford
A. A. Wilkins
Canadian Observers to the Potential Gas Committee

Potential Gas Agency
Colorado School of Mines

May 1981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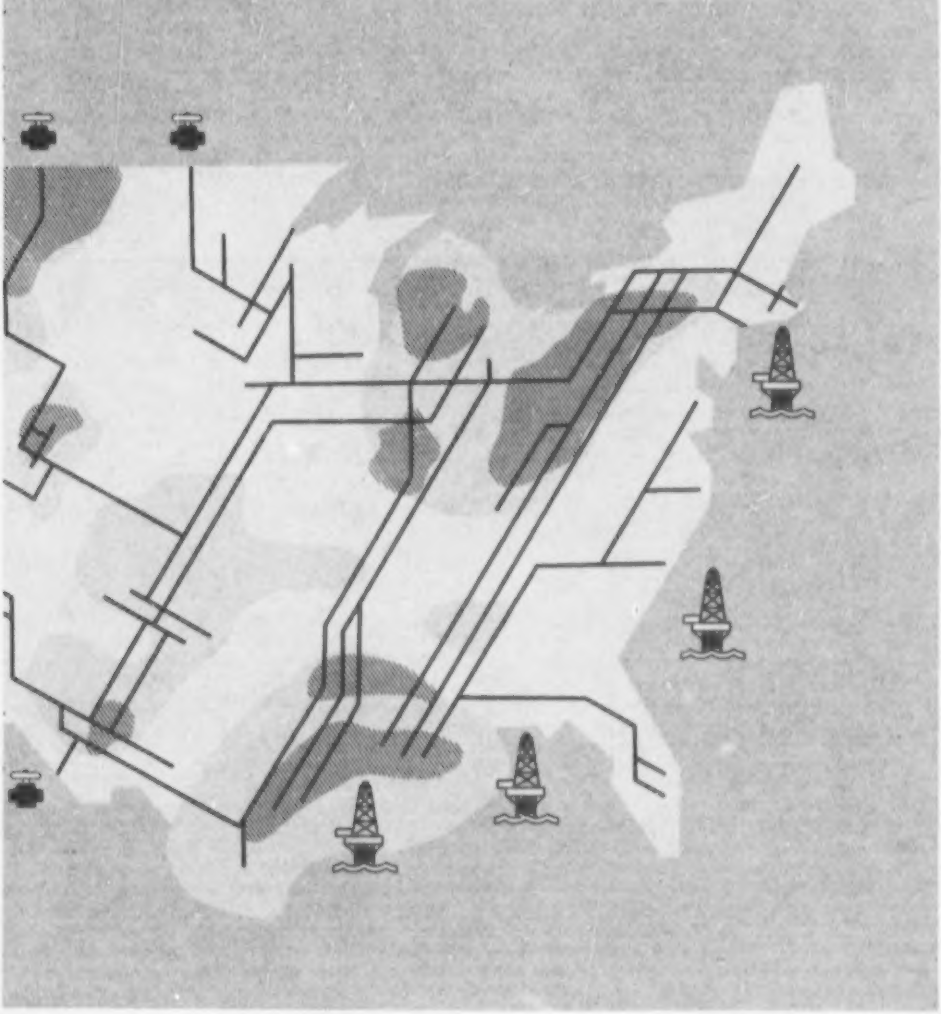
NATURAL GAS SUPPLY PIPELINES
AREAS OF PRESENT NATURAL GAS PRODUCTION FROM CONVENTIONAL SOURCES
AREAS OF POTENTIAL NATURAL GAS PRODUCTION FROM NONCONVENTIONAL SOURCES (TIGHT SAND FORMATIONS, GEOPRESSURED AQUIFERS, DEVONIAN SHALES, GASEOUS COAL SEAMS)
OFFSHORE AREAS CURRENTLY SUPPLYING NATURAL GAS OR WHERE THERE EXISTS A MAJOR EXPLORATION INTEREST
NATURAL GAS FROM ALASKA, CANADA AND MEXICO

Of Conventional And Nonconventional Gas and the Natural Gas Transmission System



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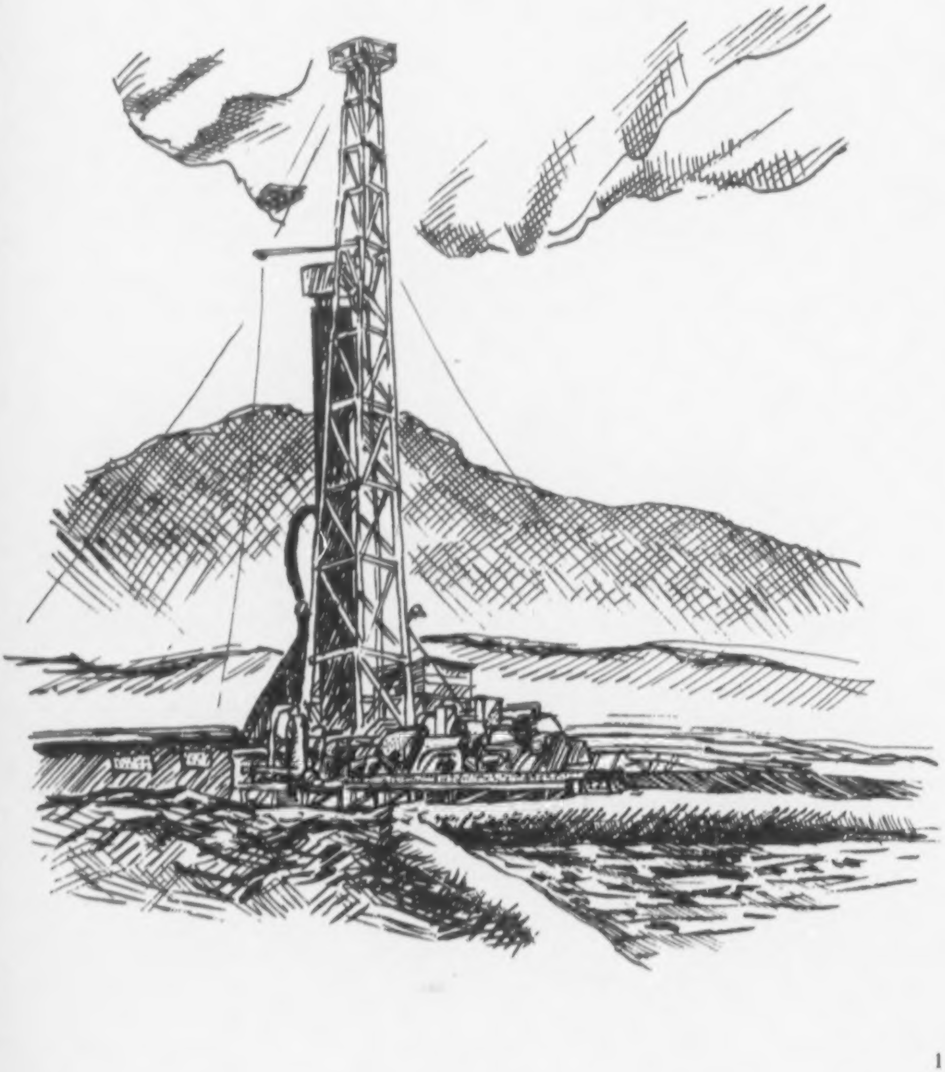
PART I

REPORT OF THE POTENTIAL GAS COMMITTEE



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REPORT OF THE POTENTIAL GAS COMMITTEE

Summary

The Potential Gas Committee comprises volunteer members from the natural gas industry, government agencies, and academic institutions who are concerned with natural gas resources. The Committee functions independently but with the guidance and assistance of the Potential Gas Agency of the Colorado School of Mines. The Potential Gas Agency is supported by the American Gas Association. Biennial estimates of the potential supply of natural gas have been prepared and published since 1966, with the exception of 1974.

The Potential Gas Committee's estimate of the potential supply of natural gas in the United States, as of December 31, 1980, is as follows:

Table 1 — Estimated potential supply of natural gas (trillions of cubic feet at 14.73 psia and 60° F.)

	Probable	Possible	Speculative
Lower 48 States			
—Onshore	151	264	196
—Offshore	34	65	58
Alaska			
—Onshore	6	16	28
—Offshore	2	13	80
Total United States	193	358	362

The sum of these estimates represents a total resource potential of 913 trillion cubic feet (Tcf).

The foregoing estimates represent the conventional potential supply expected to be recovered by future drilling under conditions of:

1. Adequate economic incentives in terms of price/cost relationships, and
2. current or foreseeable technology.

These estimates do not assume any fixed time schedule for the discovery and production of future gas supply.

The Potential Gas Committee's estimates do not include and are distinct and separate from the volume of proved recoverable natural gas reserves estimated by the Committee on Natural Gas Reserves of the American Gas Association. That Committee has estimated proved recoverable reserves in the United States to be 195 trillion cubic feet as of December 31, 1979. The relationship between proved reserves and the several categories of potential natural gas supply is illustrated in figures 2 and 3, and described in detail in the section entitled "Categories of Natural Gas Resources."

The Potential Gas Committee's previously published estimates of each category, as of December 31, 1978, of the potential supply of natural gas in the United States were as follows (trillions of cubic feet): Probable 199, Possible 399, and Speculative 421.

Comparison of these totals with the new estimates presented in table 1 reveals significant decreases between 1978 and 1980 in both the Possible and Speculative categories. The decrease in the total estimate for the Speculative category largely reflects re-evaluation of industry's former optimism toward the gas potential for the Atlantic offshore areas and Alaska. Although 1980 Speculative estimates show a large increase for Area H reflecting favorable exploration results in Wyoming, Utah and Colorado basins, this increase was offset by the decreases in Alaska and offshore Atlantic. The decrease in the total estimate for the Possible category also reflects the decrease in estimated potential for Alaska, which accounts for 27 percent of the decrease. The remaining decrease in total estimate for the Possible category is because of a number of small changes throughout the United States as potential areas were re-evaluated and as quantities were shifted from the Possible category to the Probable category. Only a slight decrease occurred overall in the Probable category. There has been a significant increase in the estimates for all categories for resources which are projected to exist in onshore areas at drilling depths of 15,000 to 30,000 feet. This increased optimism for the resource potential of deeper reservoirs is based on the larger amount of geophysical and geological information now available and on the success of recent deep exploratory drilling. Estimates for all categories reflect the net result of decreases in potential supply due to transfers from potential supply to proved reserves, re-evaluations of estimates within potential supply categories, and transfers from one potential supply category to another as new information has been obtained from exploration activities and drilling.

Introduction

The objective of the Potential Gas Committee is to provide realistic estimates of the potential supply of natural gas which, in conjunction with estimates of proved reserves of natural gas, make possible an appraisal of long-range gas supply.

Annual estimates of proved reserves of natural gas in the United States were prepared, through 1979, by the Committee on Natural Gas Reserves of the American Gas Association. These estimates are, by definition, limited to those estimated proved recoverable reserves of natural gas which have been established by drilling. Such estimates do not reflect potential supplies of natural gas which may be discovered as a result of future exploratory drilling. It is the estimates of future potential supply which are the concern of the Potential Gas Committee and which are discussed in this report.

A report on the potential resources of natural gas from nonconventional sources is included in Part II of this publication. It represents a review of the information available to the Potential Gas Agency to the time of publication. It is not an independent evaluation of the potential of these resources by either the Potential Gas Committee or the Potential Gas Agency but it is an attempt to consolidate a brief review of potential nonconventional resources of natural gas currently being investigated in this country. This report was prepared in the offices of the Potential Gas Agency by James C. Donaldson and James J. Emme, and it was reviewed by a number of experts in the respective fields who are credited at the beginning of the report.

A second report, and a new addition to the biennial reports on potential supply of natural gas in the United States, is a review of the potential resources of conventional natural gas in Canada. This review was prepared by Donald W. Axford and A. A. Wilkins, who are the Canadian observers to the Potential Gas Committee, and is included in Part III of the report. Data contained in the review are taken entirely from Geological Survey of Canada Open-File Release No. 767, prepared by R. M. Proctor, P. J. Lee and D. N. Skibo and released in March 1981.

HISTORY OF POTENTIAL GAS COMMITTEE

For many years, estimates of future supply of natural gas have been developed by numerous individuals and organizations. Since these estimates of future supply varied widely and often had entirely different objectives and meanings, they have served to confuse rather than to clarify the long-range outlook for natural gas supply. With the view to achieving a more unified industry-sponsored effort, many of the leaders of the natural gas industry, as well as various financial and governmental agencies, expressed a strong desire for a continuous long-range study of the requirements and supply of natural gas in the United States. As a result, in 1960 the Future Requirements and Supply Committees were formed and charged with the responsibility of developing such estimates. The Supply Group was organized into twelve area subcommittees that were comprised of many qualified geologists and engineers, each expert in the occurrence of natural gas in a particular area. Each area subcommittee chairman was responsible for the estimate of potential supply of natural gas in a geologically significant area of the United States. Participation by producers, distributors, pipeliners, state organizations, academicians, and consultants assured the objectivity of the study. The Future Gas Supply Committee issued its report in 1964 giving the committee's estimates of the United States potential gas supply as of the end of 1963.

In June 1966, the Gas Industry Committee, composed of representatives of the American Gas Association, the American Petroleum Institute and the Independent Natural Gas Association of America, suggested supporting a study of the future natural gas supply. In October 1966, an organizational structure was set up which provided for even broader and more diversified representation from other organizations interested in gas supply. Active supervision by the Mineral Resources Institute of the Colorado School of Mines Foundation, Inc., also was provided by the new structure. Formal announcement of the reorganized structure of the several committees was made in February 1967.

The initial report of the Potential Gas Committee was published in 1967 and covered the estimated potential gas supply as of December 31, 1966. Subsequent reports presented the Committee's estimates as of the ends of the years 1968, 1970, 1972, 1976, and 1978.

After the publication, in November 1973, of the report as of 12/31/72, a study was undertaken to determine if the work of the Potential Gas Committee should be continued and if the Committee should continue to publish regular reports. Early in 1976 it was determined that the program should continue and the decision was made to prepare estimates of the potential gas supply as of the end of 1976. Sponsorship of the Potential Gas Agency and, through it, the Potential Gas Committee was transferred from the Gas Industry Committee to the Gas Supply Committee of the American Gas Association.

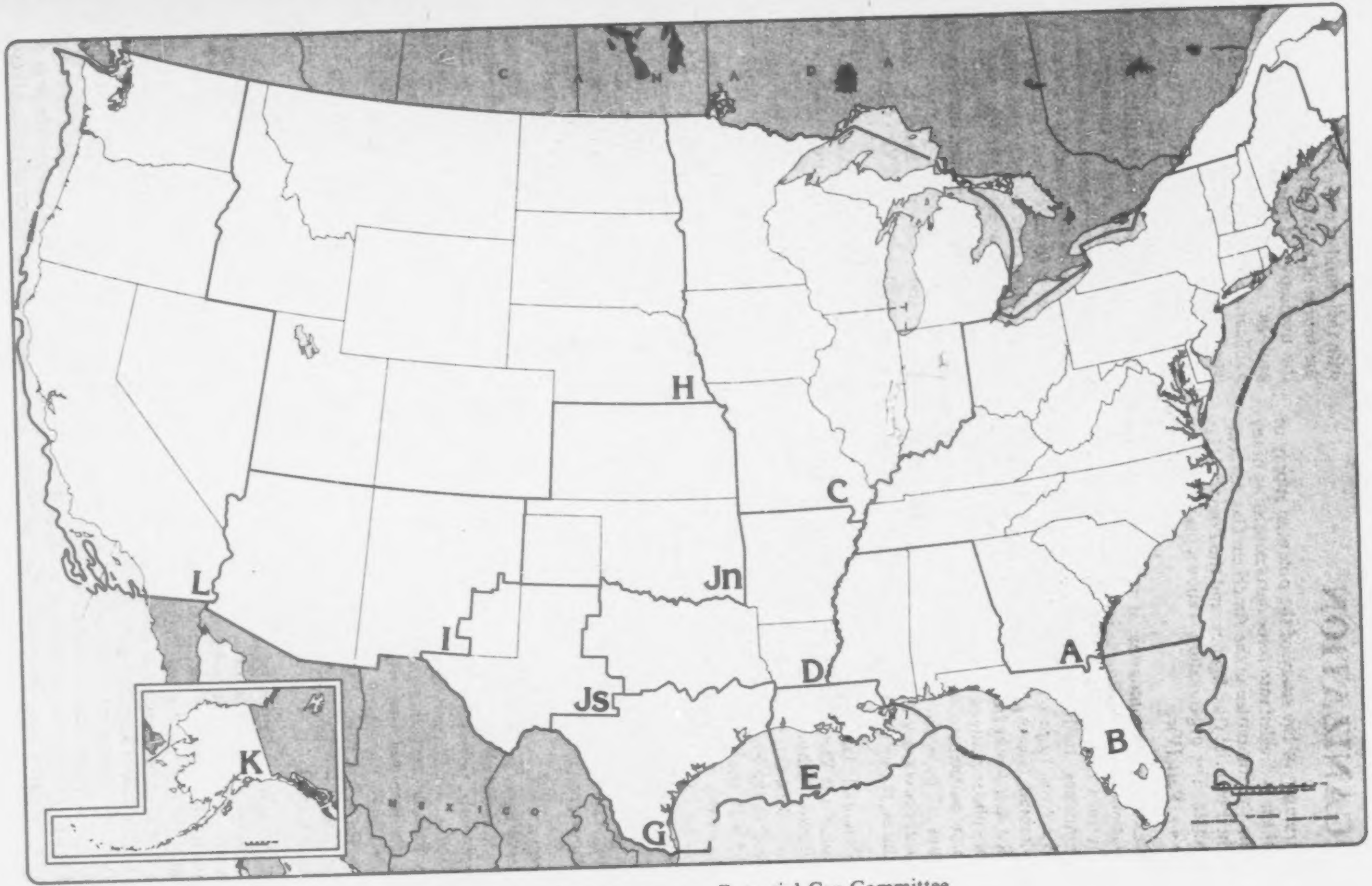
C A N A D A
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Figure 1 — Reporting areas—Potential Gas Committee

ORGANIZATION

The structure of the study of the potential supply of natural gas is divided into three parts consisting of the Gas Supply Committee of the American Gas Association, the Potential Gas Agency, and the Potential Gas Committee. The organization is shown graphically in figure 48 (Part IV).

The Gas Supply Committee of the American Gas Association takes no part in the work or the deliberations of the Potential Gas Committee or its subcommittees. Its functions are: to establish policy and objectives, to provide financial support, to select the Potential Gas Agency, and to aid in obtaining qualified manpower for the Potential Gas Committee and its subcommittees. The Gas Supply Committee does not participate in the studies leading to the estimates of potential supply of natural gas and it neither approves nor disapproves the definitions and procedures, the estimates, or the report.

The Potential Gas Agency functions under the direction of the Vice President for Academic Affairs of the Colorado School of Mines. The School, with the approval of the Gas Supply Committee, appoints staff personnel to the Potential Gas Agency. The Agency is charged with the maintenance of scientific standards and objectivity of studies, and publishes the reports of the Potential Gas Committee. The Agency appoints the Chairman and Regional Vice Chairmen of the Potential Gas Committee, approves the appointment of members, representatives, and observers to the Potential Gas Committee, and the chairmen of all subcommittees.

The Potential Gas Committee comprises members, representatives, and observers from the producing, pipeline and distribution branches of the gas industry, together with observers from the American Gas Association, the Department of Energy, the Federal Energy Regulatory Commission, the U.S. Geological Survey, the National Association of Regulatory Utility Commissioners, the Interstate Oil Compact Commission, the Bureau of Mines, the Gas Research Institute, and the Institute of Gas Technology, and representatives from Canada.

Twelve Area Work Committees are the backbone of the Potential Gas Committee. Each of the Work Committees has the responsibility of developing an estimate of the potential supply of natural gas in a particular part of the United States. Following the system long used by the petroleum industry, each Area Work Committee is assigned geologically significant areas (without specific regard to state lines) in which the Committee members have expert working knowledge. Figure 1 shows the boundaries of the Area Work Committee assignments. These committee members, with their fund of information (often confidential), are the source of knowledge and judgment for estimating the undiscovered gas supply in each area. Because geologic rather than geographic divisions are used, publication of estimates by individual states is not feasible.

The membership of Area Work Committees consists of employees and consultants associated with the producing, pipeline, and distribution segments of the gas industry — as well as qualified personnel from State and Federal Agencies and educational institutions. The guidelines specify that each Area Work Committee is to have at least one officially designated representative from both the natural-gas pipeline and distribution segments of the industry.

For administrative purposes, the Area Work Committees are grouped together in three regions: Eastern, Central and Western. Each of these regions is supervised by a Regional Vice Chairman who coordinates activities of the Area Work Committees within his jurisdiction and works with the Potential Gas Committee Chairman in order to assure that there is an open flow of communication in both directions, and that the established techniques for resource estimation are being followed by the Area Work Committees.

The Chairman of the Potential Gas Committee is assisted by the three Regional Vice Chairmen and by an Executive Committee composed of senior members of the Potential Gas Committee, including past chairmen. It is the function of the Executive Committee to advise the Chairman on policy matters. An Editorial Committee is charged with approving the content of the report of the Potential Gas Committee.

The Definitions and Procedures Committee has the responsibility of reviewing and recommending to the membership of the Potential Gas Committee any proposed changes in the definitions and procedures used in the estimation of potential gas resources.

The membership of the Potential Gas Committee, the Area Work Committees, the Executive and Editorial Committees, and other subcommittees is given in Part IV of this report. Brief biographical information for members is also included.

Categories of Natural Gas Resources

The estimates of potential supply of natural gas presented in this report can be used responsibly only with a thorough understanding of how they are defined and what they represent. An overlying constraint on estimating the amount of any natural resource is what

<table>
<tr><th colspan="5">ULTIMATELY RECOVERABLE VOLUME</th></tr>
<tr><td colspan="2">DISCOVERED</td><td colspan="3">UNDISCOVERED</td></tr>
<tr><td rowspan="2">CUMULATIVE PRODUCTION</td><td rowspan="2">PROVED RESERVES</td><td colspan="3">POTENTIAL SUPPLY</td></tr>
<tr><td>PROBABLE</td><td>POSSIBLE</td><td>SPECULATIVE</td></tr>
</table>

Figure 2 — Categories of past, present and future natural gas supplies

is known about it. Unlike some other resources, natural gas is unseen and very diffuse. It is found in porous rocks buried beneath the surface of the earth. Accumulations are found in a wide variety of structural and stratigraphic traps. Such characteristics make precise estimates difficult to calculate without a large amount of data. Since the data base is never as complete as one may wish, estimates are often considered to be inaccurate and, therefore, subject to severe criticism.

In order to be able to report reliable and meaningful estimates, the Potential Gas Committee has adopted a number of supply or resource categories. To ensure credibility, the categories are established on the basis of specific criteria. Much of what is known about natural gas accumulation is based on geological principles. It is, therefore, reasonable to utilize this type of knowledge and the availability of this knowledge as a basis for defining specific categories. The categories of natural gas resources used by the Potential Gas Committee are shown in figure 2 and are defined and discussed in the following section. A schematic representation of the various categories of potential supply is illustrated in figure 3.

DEFINITION OF NATURAL GAS

Natural gas, as used in this report, is any gas of natural origin that is composed primarily of hydrocarbon molecules producible from a borehole. Most natural gas contains some nonhydrocarbon components such as carbon dioxide, nitrogen, hydrogen sulfide, helium, etc.; however, in estimating potential supply, it is not feasible to separate small volumes of these components from the hydrocarbons. In areas or formations that are believed to contain large volumes of such nonhydrocarbons, these components are not counted as potential supply.

NATURAL GAS RESOURCES

At a given time a finite volume of natural gas in-place exists within the rocks of the shallow portion of the earth's crust. This finite volume of gas in-place is the natural gas resource. The amount of this resource which is recoverable now or in the future is a function of technology and economics. Today, technology has advanced to the degree that a large part of the resource base can be recovered. A part of this resource, however, is not recoverable because it is dispersed throughout the rock in minute accumulations which cannot be extracted with existing or foreseeable technology, and also because the cost of recovery of this gas is too high compared to the value of the gas. Even if the technology were to exist, production of some deposits would not be feasible because recovery of such accumulations would require more energy than that provided by the gas produced.

Estimates of the Potential Gas Committee include only the natural gas resource which can be discovered and produced using current or foreseeable technology and under the condition that the price/cost ratio will be favorable. This total quantity is referred to as the *Ultimately Recoverable Volume*. In previous reports of the Potential Gas Committee, this quantity has been referred to as *Ultimately Discoverable Volume*. Both terms are synonymous, but the new terminology has been adopted in this report to emphasize that the Committee is presenting estimates of natural gas which they believe can be both *discovered* and *recovered* under the limiting conditions established by the Committee.

The *Ultimately Recoverable Volume* represents the quantity of natural gas expected to be produced during the life of the industry through exploration and development of the resource. Recovery would be effected by utilizing conventional techniques of exploration, drilling, completion and production and also by incorporating new technological develop-

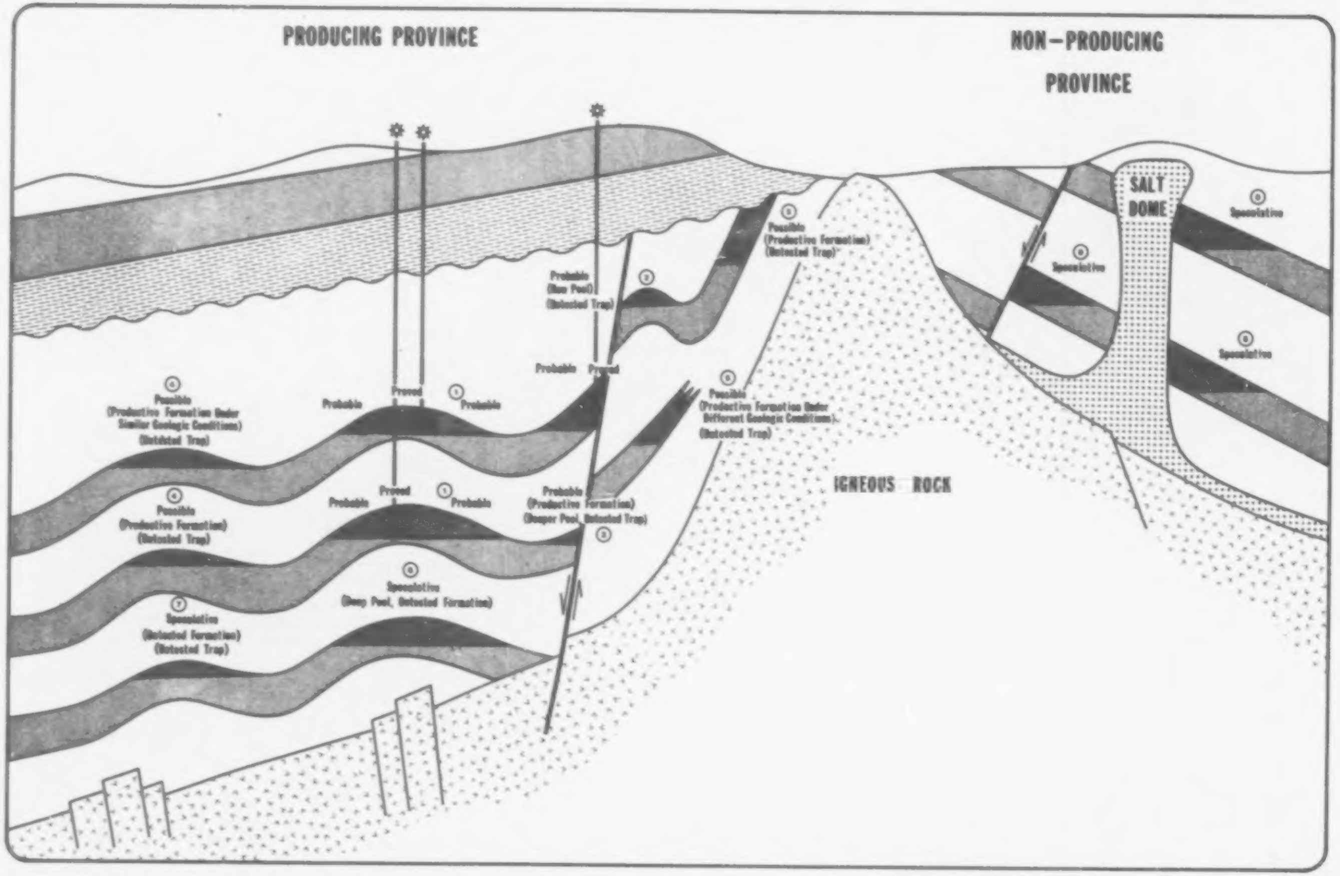
PRODUCING PROVINCE
NON-PRODUCING PROVINCE
Possible (Productive Formation Under Similar Geologic Conditions) (Untested Trap)
Probable
Proved
① Probable
Probable (New Pool) (Untested Trap)
②
Probable
Proved
Possible (Productive Formation) (Untested Trap)
Proved
Probable
① Probable
Probable (Productive Formation) (Deeper Pool, Untested Trap)
③
Possible (Productive Formation Under Different Geologic Conditions) (Untested Trap)
Speculative (Deep Pool, Untested Formation)
⑦ Speculative (Untested Formation) (Untested Trap)
IGNEOUS ROCK
SALT DOME
Speculative
Speculative
Speculative

Figure 3 — Schematic representation of categories of potential supply

ments. The Ultimately Recoverable Volume is composed of both the *discovered* and the *undiscovered* natural gas resources. Discovered gas consists of the quantity which has been produced in past years plus that which has been proved by drilling and engineering tests and is included in present *Proved Reserves*. Additionally, discovered gas includes the gas, remaining in known fields, which will be recovered through extension and complete development of known pools and reservoirs. The undiscovered resource consists of the potential gas supply which is expected to become productive upon further exploration and development and includes both the gas remaining in undiscovered pools and reservoirs within known fields and the gas which may be discovered in new fields and reservoirs within provinces which are presently productive and within provinces which are as yet unproductive.

The subdivision of Ultimately Recoverable Volume into categories reflects the variation in the amount of geological and engineering information upon which the estimate is based. Proceeding from left to right in figure 2, the level of geological and engineering knowledge decreases.

Past production is reported as cumulative production and is the total volume of natural gas withdrawn from producing reservoirs. Some uncertainty involving the amount of production from earlier years exists as a result of incomplete records, but a reasonable estimate has been made based on available information. Estimates of past production presented in this report have been prepared by the Committee on Natural Gas Reserves of the American Gas Association.

Figure 3 — Schematic representation of categories of potential supply

I Probable — Associated with existing fields — most assured,
  1) Discovered: discovered trap, existing production [1]
  2) Undiscovered: undiscovered trap, productive formation — supply from new pool discoveries within existing fields in
    a) reservoir producing within the same field [2]
    b) shallower or deeper formations producing elsewhere within same geologic province or subprovince [3]

II Possible — Associated with productive formations — less assured,
  1) Similar geologic conditions [4]
  2) Different geologic conditions: e.g., stratigraphic vs. structural trap [5]

III Speculative — Most nebulous
  1) From nonproductive formations in productive province
    a) new pool [6]
    b) new field [7]
  2) From nonproductive province [8]

Proved reserves are the currently estimated quantity of natural gas which analysis of geologic and engineering data demonstrate with reasonable certainty to be recoverable in the future from known oil and gas reservoirs under existing economic and operating conditions. Reservoirs are considered proved that have demonstrated the ability to produce by either actual production or conclusive formation tests. The Potential Gas Committee does not estimate volumes of proved reserves. Estimates of proved reserves were compiled annually from 1946 through 1979 by the Committee on Natural Gas Reserves of the American Gas Association (AGA). The AGA estimates have been largely supplanted by reports prepared by the Energy Information Agency of the U.S. Department of Energy (EIA). EIA reports of U.S. proved reserves began with data for 1977 and are expected to replace the AGA estimates for 1980 and subsequent years.

The *Potential* supply includes the remaining portion of discovered gas resource in addition to proved reserves and all of the undiscovered resource. Three categories of potential supply are recognized and reported by the Potential Gas Committee: Probable, Possible and Speculative. These three categories are differentiated on the basis of variation in available geologic information. The reported figures are the estimate of the most likely amount of natural gas (i.e., modal value) that can be expected to be found and recovered in each category.

Probable potential gas supply is associated with existing fields. It is the most assured of potential supplies because it is associated with known accumulations and a relatively large amount of geological and engineering information is available to aid in estimation of the reported figures in this category. The Probable supply bridges the boundary between discovered and undiscovered resources. The discovered portion includes supply from future extensions of *existing pools* in known productive reservoirs [1].* The undiscovered portion of Probable supply is expected to come from future *new pool* discoveries within existing fields either in 1) reservoirs productive elsewhere in the field [2], or 2) in shallower or deeper formations known to be productive elsewhere in the same geologic province or subprovince [3].

Possible potential supply is a less assured supply because it is postulated to exist outside of known fields,

---

*Numbers in brackets refer to accumulations shown diagrammatically in figure 3.

UNITED STATES GEOLOGICAL SURVEY RESOURCE APPRAISAL GROUP CIRCULAR 725	INFERRED RESERVES	UNDISCOVERED RECOVERABLE RESOURCES	
POTENTIAL GAS COMMITTEE	PROBABLE	POSSIBLE	SPECULATIVE

Figure 4 — Comparison of U.S. Geological Survey and Potential Gas Committee natural gas resource classification categories

but it is associated with a productive formation in a productive province. Its occurrence is indicated by projection of plays or trends of a producing formation into a less-well-explored area of the same geologic province or subprovince. Supply is from *new field* discoveries, postulated to occur within these trends or plays under both similar [4] and different [5] geologic conditions (i.e., the types of traps and/or structural settings may either be the same or differ in some aspect).

Speculative potential gas supply is the most nebulous of new supplies. This supply is from formations or provinces which have not yet proven to be productive. Geologic analogs are developed in order to ensure reasonable evaluation of these unknown quantities. Supply is from *new pool* [6] or *new field* [7] discoveries in *formations not previously productive* within a productive geologic province or subprovince and also *new field* discoveries within a geologic *province not previously productive* [8].

To reiterate, the accuracy of the estimates of gas volumes included in the potential supply is dependent upon geological conditions and knowledge and the extent to which the given area has been explored and developed. By following the estimation guidelines as closely as possible, consistency and compatibility of the estimates by members of the Potential Gas Committee are maintained. However, the individual estimator may have to use slight modifications of the considerations and procedures when compiling estimates for each of the three categories because of the particular characteristics applicable to his reporting area.

Estimates of potential resources of natural gas in the United States are also made by the Resource Appraisal Group of the United States Geological Survey. Their most recent published report is contained in U.S.G.S. Circular 725[1] and includes estimates of crude oil and natural gas liquids as well as natural gas. A preliminary report containing revisions of the estimates in Circular 725 was issued in early 1981 as Open-File Report 81-192. Although resource terminology of the U.S.G.S. Resource Appraisal Group differs from that used by the Potential Gas Committee, the U.S.G.S. category Inferred Reserves is essentially equivalent to Probable resources, and the U.S.G.S. category Undiscovered Recoverable Resources is essentially equivalent to the combined Possible and Speculative categories (fig. 4). A further discussion of the definitions and usage of U.S.G.S. terminology is set forth in U.S.G.S. Circular 831[2].

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[1] Miller, B. M., et al., 1975, Geological Estimates of Undiscovered Recoverable Oil and Gas Resources in the United States: U.S. Geological Survey Circ. 725, 78 p.

[2] U.S. Bureau of Mines and the U.S. Geological Survey, 1980, Principles of a Resource/Reserve Classification for Minerals: U.S. Geological Survey Cir. 831, 5 p.

Estimation of Potential Gas Supply

TECHNIQUES FOR ESTIMATION OF POTENTIAL GAS SUPPLY

A basic technique for estimating potential gas supply is applied to each of the categories adopted by the Potential Gas Committee. In each case, what is known about the prospective area is evaluated relative to what is known about natural gas accumulations and the factors known to control their occurrence. Studies of producing areas have provided information on the productive capacity of particular formations and the average size of accumulations. Natural gas occurrences are related to conditions which favor their formation and accumulation, such as the existence of source rocks, sufficient maturation of organic material, and presence of reservoir rocks and traps. Modification of the basic technique is necessary to accommodate the variations in amount of information available for prospective areas. In the most simplified form, the potential supply is derived by: (1) estimating the volume of potential gas-bearing reservoir rock, (2) multiplying this quantity by a yield factor,* and (3) discounting to allow for the probability that the traps and/or the accumulations exist. Figures 5-8 illustrate the modifications applied to this procedure for the different categories.

Probable potential supplies bridge the division between discovered and undiscovered resources. The discovered portion includes extensions of accumulations which are estimated to be partially developed. The undiscovered portion is composed of new pools which may be discovered within an existing field. In the case of *discovered Probable* potential (fig. 5), the volume of potential rock is calculated to the limits of pool development based on geological, geophysical and engineering data and is adjusted for such possible variations as changes in lithology, thickness, porosity, permeability, hydrodynamic conditions or gas/oil/water relationships in the reservoir. The adjusted volume is multiplied by a yield factor obtained from the area of the field which is presently producing from the same formation as the extension being evaluated. To arrive at a *Probable* potential resource estimate, the product of the reservoir volume and the yield factor is then multiplied by the probability that the accumulation actually exists. This probability is determined by the estimator based on previous experience in development of similar fields in the province.

Estimating *undiscovered Probable* potential supply (fig. 6) involves more geological and geophysical interpretation in order to delineate all possible new pools within existing fields. The volume of potential gas-bearing reservoir rock is calculated for known and untested traps (as in the case of suspected multizone development of an anticlinal trap) and potential but unknown traps (pools separated from current production by faults or facies changes, such as overlapping barrier bars). This calculated volume is then adjusted for possible changes in lithology and reservoir characteristics. Variations of this type might include lateral changes in the bedding such as sand pinchouts or facies changes. Proper evaluation requires a familiarity with both the nature of the formation within the province and also the local facies and structural setting. The adjusted volume is multiplied by an adjusted yield factor which is obtained by analogy with a producing area similar to the potential new pool under consideration. The yield factor is adjusted to account for any differences thought to exist between the analog and the potential reservoir. These differences may include such factors as different porosities and permeabilities due to diagenetic changes resulting from different depths of burial or deposition within different energy regimes. Presence or absence of source rocks and their maturation levels must also be considered. The amount of potential supply thus calculated must then be discounted by two factors. The first discount factor is a measure of how certain the estimator is of the existence of the traps. In the case of potential multizone anticlines, the traps are known to exist and the probability is one. This probability for unknown traps is more difficult to assess and a thorough understanding of the geology is important in order to make an educated evaluation. The second discount necessarily considers the possibility that even though all conditions are favorable for an accumulation,

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*Yield factors represent the amount of gas expected to be produced from a given unit of rock. They are calculated using data from known gas accumulations considered to be most similar to the one being evaluated. The yield is the volume of discovered gas (i.e., cumulative production plus proved reserves) divided by the volume of productive rock.

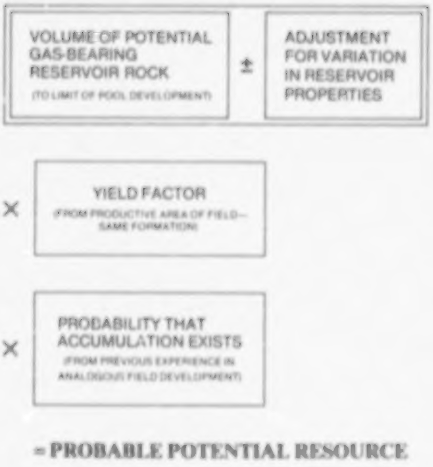
VOLUME OF POTENTIAL GAS-BEARING RESERVOIR ROCK
(TO LIMIT OF POOL DEVELOPMENT)
±
ADJUSTMENT FOR VARIATION IN RESERVOIR PROPERTIES
×
YIELD FACTOR
(FROM PRODUCTIVE AREA OF FIELD— SAME FORMATION)
×
PROBABILITY THAT ACCUMULATION EXISTS
(FROM PREVIOUS EXPERIENCE IN ANALOGOUS FIELD DEVELOPMENT)
= PROBABLE POTENTIAL RESOURCE

Figure 5 — Schematic procedures for estimation of discovered Probable potential supply

including the existence of a trap, no gas may actually have accumulated in the trap, for instance, because the trap did not exist at the time of migration of the gas. With inclusion of these two discount factors, an estimate of the *undiscovered Probable* potential resource can be made.

Estimating *Possible* potential supply (fig. 7) is essentially the same as for the undiscovered Probable category. Both situations involve untested traps within formations productive within the province but differ in their association with proved production. Possible supplies are located within a productive province, but away from presently productive fields. For this reason it is necessary to consider the possible existence of producing trends or plays. By extending a trend or a play from a productive area into a relatively unexplored area, a reasonable geologic interpretation can be made about the number and types of traps to be found in that region. Available geophysical or geological data may also indicate the location and possible size of potential traps. Careful evaluation of the trend or play (e.g., do the variations in reservoir or trap characteristics diminish or increase the probability of accumulation in less-well-explored areas) is necessary to ensure proper reservoir volume and yield adjustments and reasonable estimates for trap and accumulation discounts. The probabilities for the existence of traps and accumulations are dependent on how strongly the trend or play is established and the quality and quantity of available exploration data.

The estimation of *Speculative* potential supply (fig. 8) involves estimating accumulations which may be found in untested sediments located in either producing or non-producing provinces. Estimates are based on whether or not factors considered favorable for gas accumulations are present. These factors include the type of sediments to be found, their stratigraphic relationship, and tectonic and burial (thermal maturation) history. Types of sediments must be evaluated to determine if favorable reservoir and source rocks exist. Structural and stratigraphic information is necessary to decide if potential traps are present in the area. Burial history must be considered, if source rocks are present, in order to investigate possible maturation levels and if gas generation has taken place. Yield factors are estimated using known production statistics from other provinces. In these other provinces gas is produced from formations which are different from

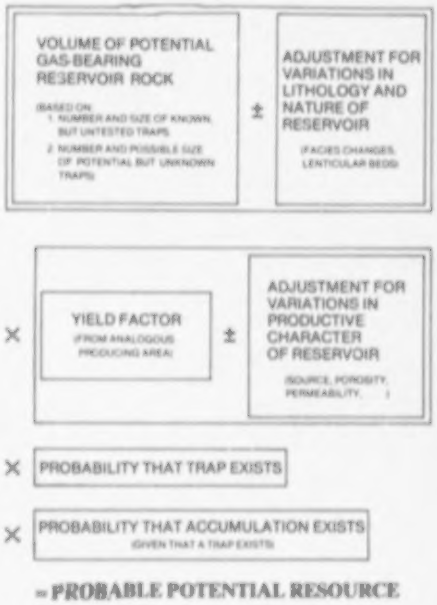
VOLUME OF POTENTIAL GAS-BEARING RESERVOIR ROCK
(BASED ON:
1. NUMBER AND SIZE OF KNOWN BUT UNTESTED TRAPS
2. NUMBER AND POSSIBLE SIZE OF POTENTIAL BUT UNKNOWN TRAPS)
±
ADJUSTMENT FOR VARIATIONS IN LITHOLOGY AND NATURE OF RESERVOIR
(FACIES CHANGES, LENTICULAR BEDS)
×
YIELD FACTOR
(FROM ANALOGOUS PRODUCING AREA)
±
ADJUSTMENT FOR VARIATIONS IN PRODUCTIVE CHARACTER OF RESERVOIR
(SOURCE, POROSITY, PERMEABILITY,)
×
PROBABILITY THAT TRAP EXISTS
×
PROBABILITY THAT ACCUMULATION EXISTS
(GIVEN THAT A TRAP EXISTS)
= PROBABLE POTENTIAL RESOURCE

Figure 6 — Schematic procedure for estimation of undiscovered Probable potential supply

those in the speculative province, but characteristics of the formations in both provinces are believed to be similar. Adjustments are made to allow for dissimilarities between the two provinces being compared. The probabilities that the accumulations and traps exist are generally grouped together as one discount factor in order to derive the estimate of Speculative potential resources. The experience and judgment of the estimators are critical in making estimates of Speculative potential as they are in all resource estimation.

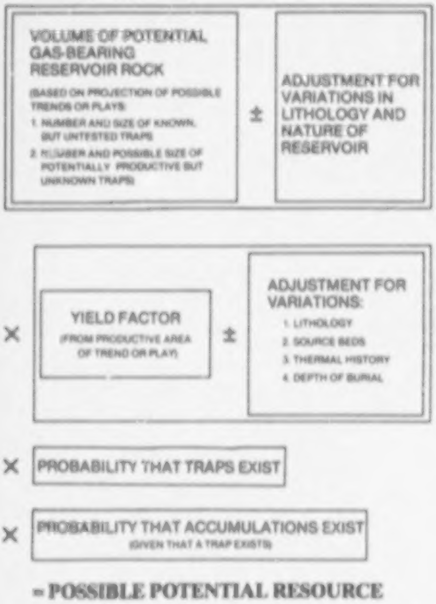
VOLUME OF POTENTIAL GAS-BEARING RESERVOIR ROCK
(BASED ON PROJECTION OF POSSIBLE TRENDS OR PLAYS:
1. NUMBER AND SIZE OF KNOWN, BUT UNTESTED TRAPS
2. NUMBER AND POSSIBLE SIZE OF POTENTIALLY PRODUCTIVE BUT UNKNOWN TRAPS)
±
ADJUSTMENT FOR VARIATIONS IN LITHOLOGY AND NATURE OF RESERVOIR
×
YIELD FACTOR
(FROM PRODUCTIVE AREA OF TREND OR PLAY)
±
ADJUSTMENT FOR VARIATIONS:
1. LITHOLOGY
2. SOURCE BEDS
3. THERMAL HISTORY
4. DEPTH OF BURIAL
×
PROBABILITY THAT TRAPS EXIST
×
PROBABILITY THAT ACCUMULATIONS EXIST
(GIVEN THAT A TRAP EXISTS)
= POSSIBLE POTENTIAL RESOURCE

Figure 7 — Schematic procedure for estimation of Possible potential supply

Procedures in Estimation of Potential Gas Supply

Members of the Potential Gas Committee are asked to apply the preceding techniques for estimation of potential gas supply to each geologic province, sub-province or other geologic subdivision for which they are responsible. Geologic provinces are large areas or regions which are unified in some way and which can be considered as a whole. In order to define provinces, similarity in geologic structure or stratigraphy exists throughout the province and is the defining characteristic. A geologic sub-province is a smaller area within the larger province, usually defined by close similarities in both geologic structure and stratigraphy, and in which either the same or closely similar formations exist throughout the province.

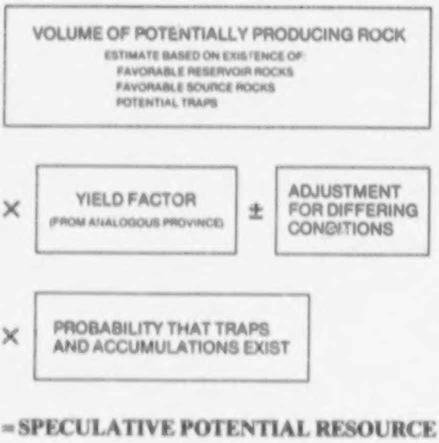
VOLUME OF POTENTIALLY PRODUCING ROCK
ESTIMATE BASED ON EXISTENCE OF:
FAVORABLE RESERVOIR ROCKS
FAVORABLE SOURCE ROCKS
POTENTIAL TRAPS
×
YIELD FACTOR
(FROM ANALOGOUS PROVINCE)
±
ADJUSTMENT FOR DIFFERING CONDITIONS
×
PROBABILITY THAT TRAPS AND ACCUMULATIONS EXIST
= SPECULATIVE POTENTIAL RESOURCE

Figure 8 — Schematic procedure for estimation of Speculative potential supply

Many times natural gas accumulations are thought of as occurring in geologic basins, which are areas of thick accumulation of sedimentary rocks generally considered to have accumulated in a topographic depression on the continent formed by tectonic processes during the geologic history of the region. However, there are many areas in the United States where large quantities of natural gas have accumulated outside of recognized geologic basins. Therefore, it is not accurate to consider the basin as the fundamental area for consideration in resource estimation.

Resource estimates are made for each geologic region by members of the Committee. In many cases, especially where the potential resources are apparently quite large, two or more independent evaluations are made by individual members of the Area Work Committees. Differences between independent estimates are reconciled by discussion and re-evaluation. Each Area Work Committee, as a whole, reviews estimates of individual estimators, and, based on the experience and knowledge of all members, accepts estimates presented or requests additional study and re-evaluation.

Each estimator is asked to consider three separate situations in preparing estimates. The first situation involves considering the quantity of gas which might exist and be recoverable under the most favorable of geologic conditions. This would mean that the maximum number of potential traps would exist with favorable source bed and reservoir conditions, and that each of the potential traps would be filled with recoverable accumulation. Such a consideration would lead to an estimate of the maximum possible resource. On the other hand, the situation is considered in which only a limited number of additional traps exist, the minimum that could be conceived based on the level of geologic information currently available, with the most marginal of source bed and reservoir conditions, and the possibility that many of the traps which might exist would not contain recoverable accumulations of natural gas. Such a consideration would lead to a minimum estimate of the resource. Finally, the estimator is asked to consider what is the most reasonable estimate both of the existence of traps and accumulations and the most reasonable assessment of the source bed and reservoir conditions. By considering all three of these situations, the estimator is best able to express both the limiting conditions within the geologic region and, also, conclude the most likely conditions to exist, having considered all factors. Only the best, or most likely, estimates are reported by the Potential Gas Committee. Neither the most optimistic outlook, resulting in a maximum estimate, nor the most pessimistic outlook, resulting in a minimum estimate, is believed to be a sound basis for future planning. The estimates which are reported are the best considered judgment of the members of the Committee based on their evaluation of all information available to them. However, it should be noted that there is a degree of uncertainty associated with each estimate which cannot be resolved until exploration, drilling, and production have been completed. The degree of uncertainty differs for each of the resource categories of the Committee. This uncertainty is discussed in more detail below. In order to present estimates for the reporting areas and depths of the Potential Gas Committee and for the United States as a whole, the best estimates for each of the geologic regions (provinces, sub-provinces, basins, etc.) are accumulated to form the totals.

Role of Judgment

The judgment of the estimator is the most significant factor in making estimates of potential supply, particularly in the resource categories of *Possible* and *Speculative*. Members of the Potential Gas Committee, having the detailed knowledge and the experience necessary to select the appropriate adjustments for an assigned geological province, use all available pertinent geological and engineering data to reflect an objective, scientific approach to the problem.

MEANING OF POTENTIAL GAS COMMITTEE ESTIMATES

The estimates presented by the Potential Gas Committee for each of the reporting areas and for each of the resource categories are the best estimates of the Committee and represent statistically the *most likely* or *modal* estimates; that is, they represent the quantity of natural gas which has the highest probability of occurrence. These most likely estimates are prepared by the members of the Potential Gas Committee following the procedures outlined in the section on Technique for Estimation of Potential Gas Supply. As explained in the preceding section, it is the policy of Potential Gas Committee to publish only the most likely estimate for each category in each area.

The actual volume of ultimately recoverable natural gas within the crust of the earth is a fixed, but unknown, quantity. Consequently, the estimates made by the Potential Gas Committee incorporate considerable uncertainty as to whether the best estimate of the Committee corresponds to the actual quantity of recoverable natural gas present beneath the surface in a given area. The degree of uncertainty increases with decreasing availability of geological, geophysical and engineering information, and with decreasing size of area considered. Hence, the Committee's use of the categories Probable, Possible and Speculative. *In all cases, it must be emphasized that the categories Probable, Possible and Speculative relate only to the degree of certainty of the accuracy of the estimates because of the differing availability of data upon which the categories of estimates are based; the estimates presented for each category represent the Committee's judgment of the best estimate with the highest probability of occurrence.*

In actual observations of the work of the Committee, there may be a slight tendency for the best (most likely) estimates to fall closer to the minimum estimates rather than to the maximum. However, there are no statistically valid data to support this tendency. There are also many optimists within the Committee whose estimates fall closer to the maximum. Also, there is no way to relate positively the estimates to the actual resource distribution. Recognizing these potential shortcomings, members of the Committee strive to be as objective as possible in making estimates.

Estimates are released only on the basis of totals for designated areas. It is believed that estimates for individual provinces, subprovinces, basins, trends, etc. are subject to a great deal of uncertainty but that aggregated totals for larger areas incorporate both optimistic and pessimistic estimates for smaller subdivisions and, consequently, approach a realistic evaluation of the potential for the area even though the uncertainty cannot be totally eliminated.

Based on the foregoing reasons, it is believed that the Committee's estimates represent a distribution such that the most likely or modal estimates correspond closely to the statistical mean. Since estimates for an area are derived by combining estimates from subareas, it is reasonable to assume that the area estimates will follow a normal probability distribution. On this assumption, the Committee's estimates can be represented as lower, modal and upper points on a normal probability curve, and such a curve is symmetrical about the mode. The lower value corresponds to an approximately 90 percent probability that there will be at least this lower amount of recoverable gas, and the upper value corresponds to an approximately 10 percent probability that there will be this upper amount of recoverable gas.

The relationship of the most likely estimates to the probability of occurrence of natural gas resources may perhaps be best explained by reference to a hypothetical plot of the actual probability of occurrence of the given quantity of natural gas in an area (fig. 9).

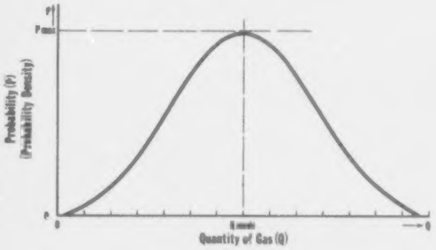

Figure 9 — Hypothetical plot of the actual probability of occurrence of the given quantity of natural gas in an area

Figure 9 demonstrates that there is the highest probability (P max) of the occurrence of a given quantity (Q mode) of natural gas at the highest, or modal, point of the curve. This Q mode is the quantity estimated by the Potential Gas Committee based on the best judgment of the members. There is a correspondingly lower probability that the actual quantity of natural gas will be something other than Q mode. Lower or higher estimates extending toward the minimum and maximum quantities which might be present can be derived by varying either the evaluation of the geologic factors which control occurrence or the discount factors applied to both the possibility of the occurrence of the trap and the accumulation of trapped gas. For example, if the reservoir conditions are not as favorable as judged by the Committee, then the quantity of gas which can be recovered would be less than that estimated by the Committee. On the other hand, if the reservoir conditions are more favorable, the quantity would be higher. Also, if the probability of both the existence of the trap and the accumulation of gas within the trap are either higher or lower, the quantity would also vary. While recognizing the possibility of this variation, members of the Potential Gas Committee feel that the most likely estimate which they present represents the best considered judgment of the Committee members as to the characteristics which exist within the area under consideration.

The "tightness" of the actual probability curve for an individual area, or the measure of uncertainty corresponding to the estimate of Q mode, will vary according to the quantity of data upon which the estimates are based and will, therefore, vary between the Probable, Possible and Speculative categories.

For Probable estimates:

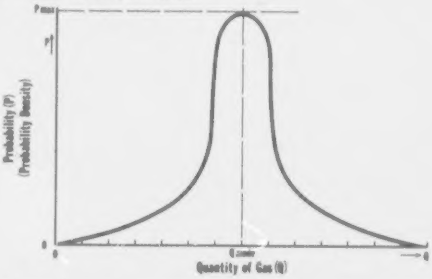

Figure 10 — Hypothetical plot of the probability of occurrence of estimates for the Probable category

It can be seen from the shapes of the curves in figures 10, 11 and 12 that there is greater uncertainty about the estimate of natural gas which is to be reported as the most likely quantity for the Speculative category than for the Probable or Possible categories. That is, there is a greater range of estimates of natural gas with a relatively high probability of occurrence and, therefore, selection of the most likely estimate for the Speculative category is more difficult than for the other categories. The uncertainty diminishes in the Possible and Probable categories with the estimate of the Probable quantity being the most certain because the greatest amount of information is available.

For Possible estimates:

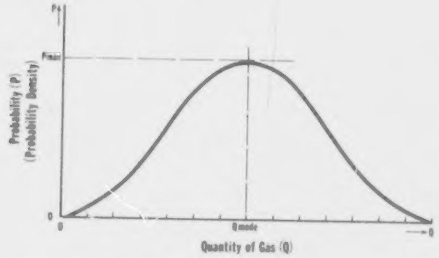

Figure 11 — Hypothetical plot of the probability of occurrence of estimates for the Possible category

For Speculative estimates:

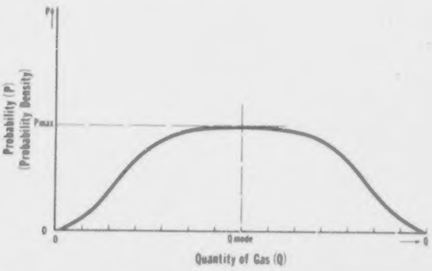

Figure 12 — Hypothetical plot of the probability of occurrence of estimates for the Speculative category

An alternate way of considering the nature of resource estimates is to look at them in terms of a cumulative probability distribution or an "at least" probability curve. In this case, the steepness of the curve will vary according to the amount of data on which it is based. For another hypothetical area, not the same as in figure 9, the cumulative probability curve is shown in figure 13.

This curve indicates that there is a very high probability of having at least a minimum quantity of natural gas present in the area and a low probability of having at least a very large amount of natural gas present. The most likely estimate or the estimate with the modal probability falls at the inflection point on the curve as indicated by the intersection of P mode and Q mode.

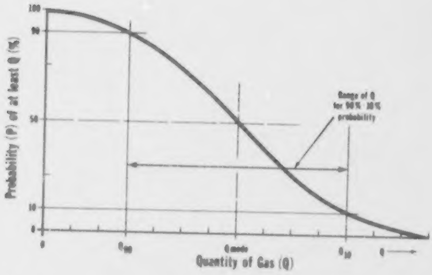

Figure 13 — Hypothetical cumulative probability (at least probability) curve for the estimates of the quantity of gas in a given area

For Probable estimates:

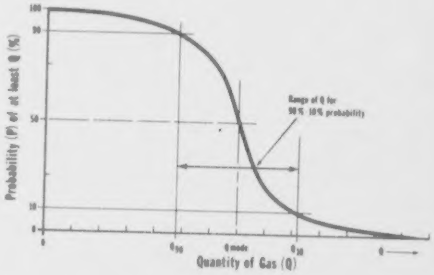

Figure 14 — Hypothetical cumulative probability (at least probability) curve for Probable estimates

For Possible estimates:

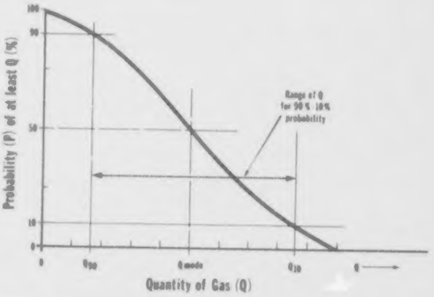

Figure 15 — Hypothetical cumulative probability (at least probability) curve for Possible estimates

For Speculative estimates:

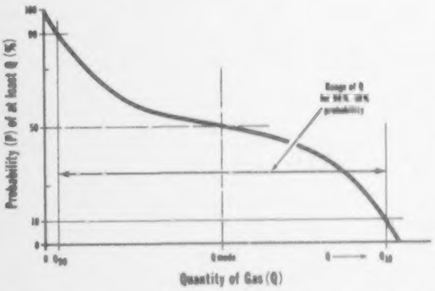

Figure 16 — Hypothetical cumulative probability (at least probability) curve for Speculative estimates

It will be noted that in the case of the Probable estimate, there is a narrow range of values of Q between the lower quantity with a high probability of occurrence (represented by Q90, or 90% probability) and the upper quantity with a low probability of occurrence (Q10, or 10% probability). The curve for possible estimates is intermediate and there is a wider range between Q90 and Q10, and the curve for speculative estimates indicates that there is a broad range between the lower (Q90) and upper (Q10) quantities.

Under the conditions related to the estimates of the Potential Gas Committee, within each category the most likely estimates for each individual basin, province or trend are additive and can be combined to give the estimate for the area. The individual components of the area totals are not normally divulged by the Potential Gas Committee for two reasons, the first being that the Committee's work is often based on confidential information shared with Committee members by employers and associates. It is this shared confidential information which gives a broader base of data and greater detail and credibility to the estimates of the Committee. However, the sharing of confidential information carries with it the requirement that the confidentiality is not compromised by releasing estimates for areas which are so small that the basic data would be indirectly revealed. The reporting areas chosen by the Potential Gas Committee are large enough that the confidentiality of information is protected and yet small enough to be geologically coherent. The second reason is that, particularly when dealing with estimates of resources in the speculative category, there may be a considerable range of uncertainty in the resource estimates for any individual basin, province or trend. By combining individual estimates for an entire area, it is hoped that overly optimistic individual estimates may be counterbalanced by other, more conservative, individual estimates and, thus, a realistic most likely estimate for the area can be achieved.

Limiting Considerations

The estimate presented here is limited to the contiguous United States, Alaska, and adjacent offshore areas. Hawaii, the island territories and their adjacent offshore areas are not included.

No potential supply of natural gas is included which exists at subsurface depths greater than 30,000 feet or, in offshore areas, where water depths are in excess of 1,000 meters (3,281 feet). Separate evaluations are made for the potential supply existing at onshore drilling depths from 0 to 15,000 feet and from 15,000 to 30,000 feet. These estimations recognize the greater technological and economic difficulty of recovering resources that exist below drilling depths of 15,000 feet. In offshore areas, estimates are made for the potential existing beneath water depths of 0 to 200 meters (656 feet) and 200 to 1,000 meters (3,281 feet). Estimates for water depths less than 200 meters essentially represent the potential supply that may be recovered from beneath the Continental Shelf whereas the estimates for water depths of 200 to 1,000 meters essentially represent resources that may be recovered from beneath portions of the Continental Slope.

The extension of Potential Gas Committee estimates to include offshore areas beneath water depths up to 1,000 meters (3,281 feet) is a significant increase from the previous depth limit of the 1968 through 1976 reports which included resource estimates out to a water depth of 1,500 feet. In the opinion of Committee members, there has been sufficient improvement in drilling, production and offshore pipeline technology to warrant this extension of limits in keeping with the Committee's concept of including all natural gas resources which could be produced in the future with normal advances in technology. There still remain questions as to the capability of completing pipeline connections in offshore water depths as great as 1,000 meters. The Committee has chosen, however, to be optimistic in its outlook and to present these estimates, recognizing that the above technical questions remain unanswered.

Estimates made by the Area Work Committees include resources which exist beneath areas presently withdrawn or proposed for withdrawal from exploration and development because of governmental action. Where there exists considerable potential beneath areas so withdrawn, it is appropriate for an estimate to be made of this potential and that estimate to be presented in the narrative portion of the report submitted by each Work Area.

Economic, technological and governmental policy considerations that are taken into account in the Potential Gas Committee's estimate of potential gas supply are related to (1) past production and proved reserves of natural gas, and (2) all wells which would be drilled in the future under the assumed conditions of adequate economic incentives in terms of price/cost relationships and current or foreseeable technology. Fundamental economic considerations — which include but are not limited to prices, costs, rates of take, recovery factors, abandonment pressures, etc. — are inherent in the definition of proved reserves: ". . . recoverable in the future from known oil and gas reservoirs under existing economic and operating conditions." Some gas that is actually present in known reservoirs is not producible because of the relationship between costs and prices, and therefore is not included in recoverable reserves.

Furthermore, there are other known gas accumulations of such small size that none of the gas can be produced in commercial quantities under " . . . existing economic and operating conditions." Such considerations result in proved reserves being something less than the total volumes of gas existing in known reservoirs. These same limitations are applicable to the estimates of potential supply. If a fundamental change in economics or technology occurs, estimates of potential supply will be changed accordingly.

The attribution technique presented in the Estimation of Potential Gas Supply section describes relationships between ultimately recoverable volumes of gas from known occurrences and prospective gas accumulations, after appropriate adjustment for variations in geological and reservoir conditions are made. The explicit assumption of adequate but reasonable prices and normal improvements in technology in the definition of potential supply relates to improvements in exploration and production techniques. Adequate prices, normal technological improvements and reasonable governmental policies are required to bring about the drilling necessary to prove the potential supply. These assumed conditions permit estimates of potential supply to be made by the Potential Gas Committee on the basis of relevant past history and experience concerning recovery factors, as well as the size and type of reservoirs which have been found, developed, and produced, without speculating as to future levels of prices and costs.

Historically, the Committee has largely excluded from its estimates the potential supply of natural gas from such nonconventional sources as geopressured-geothermal zones, gaseous coals, tight sands and certain brown shales, since the economics and technology of recovery from such sources had not yet been fully demonstrated. Technological developments and changing economic conditions in recent years have now affected certain of what had previously been considered nonconventional resources. In this report no potential supply of natural gas is included in the Committee's estimates which might be recovered from geopressured-geothermal brines of the U.S. Gulf Coast regions, directly from gaseous coal seams, or from gas hydrates. Where coals may have served as source beds for gas accumulations in conventional sandstone or limestone reservoirs, the potential resource contained in the conventional reservoir and recoverable by conventional drilling and production is included in the Committee's estimates. The potential resource from certain brown (Devonian) shales is largely excluded except that potential which the Committee believes to be recoverable by normal drilling and well stimulation and completion techniques and which is analogous in geologic setting to previous production. The natural gas potential from tight (low permeability) formations (including sandstone, shale and carbonate reservoirs) is included in the Committee's estimates to the extent that these resources fall within the limiting considerations for resource estimation. The inclusion of resources from tight gas sands of the Western states raises questions concerning the relationship of the estimates of the Committee to the estimates prepared by others for the resources in Western tight gas sands. No clear definition of the upper limits of what constitutes a tight gas sand has been given by most workers who have prepared estimates in the past. Some of the more recent estimates have included resources in formations with in situ effective permeabilities of up to 1 millidarcy. There may be overlap with the Committee's estimates since the Committee's limiting considerations would extend in some instances to resources in formations of less than 1 millidarcy permeability. Recognizing this potential overlap in estimates, the Committee intends to investigate this further during 1981 and 1982.

A review of nonconventional natural gas resources has been prepared by the Potential Gas Agency and is presented in Part II of this report. This review is in no way an independent appraisal by either the Potential Gas Committee or Potential Gas Agency of the volume of natural gas within nonconventional sources. Its purpose is merely to summarize the status of knowledge and the direction of research relative to nonconventional sources of natural gas and to present published estimates of the potential from such sources.

A review of potential resources of conventional natural gas in Canada has been prepared by the Canadian observers to the Potential Gas Committee based on the latest information available from the Geological Survey of Canada. Again, this review does not constitute an independent appraisal by either the Potential Gas Committee or the Potential Gas Agency. It is included as a service to the reader.

Estimate of Potential Supply of Natural Gas

TOTAL UNITED STATES

The potential supply of natural gas in the United States, excluding Hawaii and island territories, as of December 31, 1980, is estimated to be 193 trillion cubic feet in the *Probable* category, 358 trillion cubic feet in the *Possible* category, and 362 trillion cubic feet in the *Speculative* category (table 2). Figure 17 shows the geographic distribution of the potential supply as estimated by the Potential Gas Committee for each of the reporting areas for onshore and offshore resources.

Portions of this potential are less accessible than others due to technological and economic limitations. Recognizing the importance of accessibility, the potential resources have been summarized in table 3 by depth increments and by offshore water depth. The potential supply in Alaska is listed separately because of the unique conditions surrounding its accessibility to the United States market and because Alaska is in the early stages of exploration. In all tables, dashes are used to indicate estimated potential of less than 0.5 Tcf. All estimates are based on the volume of raw gas at 14.73 psia and 60° F.

Table 2 — Estimated potential supply of natural gas in United States by geographic areas as of December 31, 1980 (trillions of cubic feet at 14.73 psia and 60° F.)

Area		Probable	Possible	Speculative
A	Onshore	26	9	35
	Offshore	—*	—	16
B	Onshore	6	7	8
	Offshore	—	—	33
C	Onshore	—	2	1
D	Onshore	9	22	20
E	Onshore	6	16	—
	Offshore	19	40	—
G	Onshore	15	18	4
	Offshore	15	17	—
H	Onshore	40	78	69
I	Onshore	2	3	1
J-North	Onshore	27	66	42
J-South	Onshore	16	34	1
L	Onshore	4	9	15
	Offshore	—	8	9
	48 States Subtotal	185	329	254
K	Alaska—Onshore	6	16	28
	—Offshore	2	13	80
	Total United States	193	358	362

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*In all tables, dashes are used to represent estimates of potential of less than 0.5 Tcf.

Table 3—Total estimated potential supply of natural gas by depth increments (trillion cubic feet)

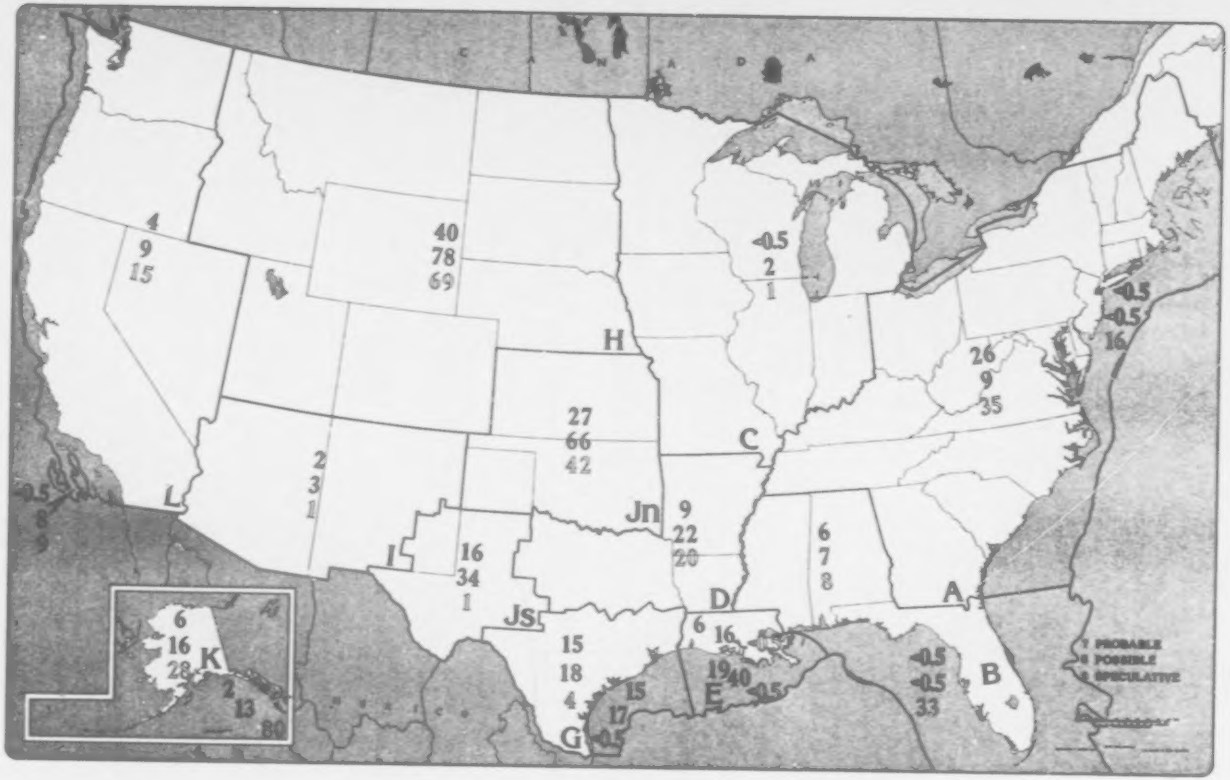
	Probable	Possible	Speculative
Onshore (Drilling Depth)			
Lower 48 States			
less than 15,000 feet	116	161	94
15,000 to 30,000 feet	35	103	102
	151	264	196
Alaska			
less than 15,000 feet	6	16	28
15,000 to 30,000 feet	—	—	—
	6	16	28
Total Onshore	157	280	224
Offshore (Water Depth)			
Lower 48 States			
less than 200 meters	32	43	35
200 to 1,000 meters	2	22	23
	34	65	58
Alaska			
less than 200 meters	2	13	68
200 to 1,000 meters	—	—	12
	2	13	80
Total Offshore	36	78	138
Total Lower 48 States	185	329	254
Total Alaska	8	29	108
Total United States	193	358	362

Probable Category

Within the onshore area of the lower 48 states, 77 percent of the Probable potential lies at drilling depths less than 15,000 feet and 23 percent lies at drilling depths between 15,000 and 30,000 feet. Eighty-two percent of the Probable potential is in onshore areas and 18 percent in offshore areas. Within the offshore area of the lower 48 states, 94 percent of the estimated Probable potential lies beneath water depths of less than 200 meters. Ninety-six percent of the total United States Probable potential is considered to exist within the lower 48 states and 4 percent in Alaska.

Possible Category

Within the onshore area of the lower 48 states, 61 percent of the estimated Possible potential lies at drilling depths less than 15,000 feet and 39 percent lies at drilling depths between 15,000 and 30,000 feet. Eighty percent of the Possible potential is in onshore areas and 20 percent in offshore areas. Within the offshore areas of the lower 48 states, 66 percent of the Possible potential lies beneath water depths less than 200 meters and 34 percent lies beneath water depths between 200 and 1,000 meters. The Possible potential for the lower 48 states is 92 percent of the total Possible potential supply while that for Alaska is 8 percent.


CANADA
4
9
15
40
78
69
H
<0.5
2
1
<0.5
<0.5
16
26
9
35
27
66
42
C
2
3
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L
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8
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34
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40
E
<0.5
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17
G
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<0.5
33
B
6
16
28
K
2
13
80
MEXICO
7 PROBABLE
8 POSSIBLE
9 SPECULATIVE

Figure 17 — Geographic distribution of potential supply as estimated by the Potential Gas Committee

Speculative Category

Within the onshore areas of the lower 48 states, 48 percent of the estimated Speculative potential lies at drilling depths less than 15,000 feet and 52 percent lies at drilling depths between 15,000 and 30,000 feet. The total potential onshore is 77 percent and 23 percent of the total potential Speculative supply for the lower 48 states lies offshore. In the offshore areas of the lower 48 states, 60 percent of the potential Speculative supply lies beneath water depths of less than 200 meters and 40 percent beneath water depths of 200 to 1,000 meters. The estimated Speculative supply for the lower 48 states is 70 percent of the total United States Speculative potential and the estimated Alaskan potential is 30 percent.

Comparisons with 1978 Report

This report reflects significant shifts in the pattern of distribution of estimated potential supply when compared to the report prepared for year-end 1978. For the lower 48 states onshore, 39 percent of the potential is estimated to lie at depths between 15,000 and 30,000 feet, compared to 32 percent of the potential in 1978. In spite of the decrease in the total estimated potential for the United States, the estimates for this deeper drilling (below 15,000 feet) have also been increased in terms of the actual estimated volume from 199 Tcf in 1978 to 240 Tcf in 1980. These increases in the estimates are the result of increased focus on exploration for deep targets and are made possible by better geophysical information and by the results of exploratory drilling in the deep portions of the sedimentary basins. Also for the lower 48 states, 20 percent of the total potential is estimated to occur offshore as compared to 26 percent in 1978. This represents a decrease in the actual estimated volumes from 216 Tcf in 1978 to 157 Tcf in 1980. The decreases in offshore areas of the lower 48 states were greatly influenced by the maturity of the Gulf Coast region in terms of exploration and production and by disappointing results of offshore exploration in the Baltimore Canyon area of the Atlantic offshore province. Alaska is now estimated to contain 16 percent of the U.S. potential compared to 19 percent in 1978. This reflects a decrease in the estimates of Alaskan potential from 189 Tcf in 1978 to 145 Tcf in 1980. The Alaskan decrease results from disappointing results in offshore areas, especially in the Gulf of Alaska, and re-evaluation of the potential of certain onshore basins.

AREA REPORTS

Area A: Ohio, Kentucky, Tennessee, Georgia, and All States Farther East and Adjacent Offshore

The potential supply of natural gas for Area A, which includes the Appalachian basin, the Triassic basins and the Offshore Atlantic, has been revised downward 35 Tcf from the report of 12/31/78. This is primarily a result of indications of a reduced natural gas potential of the U.S. Atlantic offshore region. Of the 29 offshore tests drilled since 1978, 23 were in the Mid-Atlantic (Baltimore Canyon) area, and 6 were in the South-Atlantic (Southeast Georgia Embayment) area. Significant hydrocarbon shows were present in five of the Mid-Atlantic wildcats, all of which were within a few miles of each other and approximately 100 miles off the New Jersey coast. While the natural gas potential of the Atlantic continental margins is diminished, industry indicates by decisive actions that the expensive search for economical accumulations of new reserves in the region will continue.

Onshore there has been an upward revision of natural gas potential because of significant successful wildcat drilling in Pennsylvania, West Virginia, Tennessee and Virginia in the Eastern Overthrust Belt. Testing is also anticipated for New York State in the Overthrust Belt which extends from Canada southward into Alabama and Georgia. In general, the Appalachian basin is in the early stages of a very important new exploratory campaign. Intensive geophysical surveys in the basin will almost certainly lead to new drilling programs. Natural gas potential may exist in the eastern portion of the Overthrust Belt, where a wedge of from 10,000 to 20,000 feet of clastic sedimentary rocks may be present, and, if these rocks are not metamorphosed, a virtually untested basin exists with an enormous volume of prospective rocks present.

Approximately 0.5 percent of the total region of Area A is being considered for RARE II classification and consequent withdrawal from oil and gas exploration and development. Judging by the very minor amounts of acreage so classified to date, it is the expectation that less than 0.1 percent of the proposed lands will be designated as RARE II. The potential areas, for the most part, are in the Eastern Thrust Belt or are underlain by metamorphics where the potential resource volumes are estimated to be relatively small per cubic mile of sediment. Therefore, the impact of RARE II acreage on the potential gas supply within Area A is negligible.

Table 4 — Area A. Eastern United States
Ohio, Kentucky, Tennessee, Georgia, and all states farther east
and adjacent offshore
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	26	9	24
15,000 to 30,000 feet	—	—	11
Total	26	9	35
Offshore (Water Depth)			
less than 200 meters	—	—	11
200 to 1,000 meters	—	—	5
Total	—	—	16
Area A total	26	9	51

Area B: Mississippi, Alabama, Florida, and Adjacent Offshore

There is little change in the estimates for natural gas potential for the southeastern states prepared for this report compared to the year-end 1978 report. In onshore areas there is a 1 Tcf decrease in the Possible potential for drilling depths less than 15,000 feet and an increase of 1 Tcf in each of the Possible and Speculative categories for drilling depths between 15,000 and 30,000 feet. There is no change in the estimates for the offshore area.

The changes in estimates of potential in onshore areas relate to new information gained from exploration and drilling activities. In the Black Warrior basin of northeastern Mississippi and northwestern Alabama, there continues to be strong interest in exploration and development of shallow Paleozoic fields. Most of the drilling in the Black Warrior basin has taken place in and around producing fields. The Hosston producing area of the Mississippi Salt basin is the dominant area of drilling activity in Area B. Approximately 60 wildcat wells have been drilled in this Hosston area in the past two years and 6 of these have been discoveries. Exploration for Jurassic objectives is receiving a boost with the drilling of a number of deep wells to test the Cotton Valley Formation in southern Mississippi. The discovery of the Bogalusa field in Washington Parish, Louisiana in 1979 provided the impetus for increased Cotton Valley exploration in Mississippi.

The most significant discovery in recent years of gas from Jurassic strata is the completion in 1979 of an exploratory well drilled by Mobil in Mobile Bay, Alabama. Although the potential indicated by this discovery may be very large, no further developments of this prospective area had taken place by the end of 1980 and it is too early to assess the impact of this discovery on estimates of potential supply.

There has been no exploration or drilling activity in the offshore portion of Area B and there are no new data available on which to base a revision of the estimates of offshore potential.

Table 5 — Area B. Southeastern United States
Mississippi, Alabama, Florida and adjacent offshore
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	4	4	3
15,000 to 30,000 feet	2	3	5
Total	6	7	8
Offshore (Water Depth)			
less than 200 meters	—	—	20
200 to 1,000 meters	—	—	13
Total	—	—	33
Area B total	6	7	41

Area C: Minnesota, Wisconsin, Michigan, Iowa, Illinois, Indiana, and Missouri

Area C comprises the Michigan basin, the Illinois basin and the Forest City basin. The estimates of potential gas supply have been revised downward a total of 1 Tcf since the December 31, 1978 report mainly because of transfer from potential resources to proved reserves. Discoveries resulting in additions to proved reserves have occurred in the Michigan basin where exploration for Middle Silurian Niagaran pinnacle reefs has met with continued success in producing both oil and gas discoveries. Approximately 550 productive reefs have been found in the northern reef trend. Niagaran reefs currently supply 81% of Michigan's total oil production and 89% of the gas production.

The main exploration emphasis in the Michigan basin is directed toward finding the Niagaran pinnacle reefs. In addition, there is increased interest in exploring the Central basin area where deeper drilling on known Mississippian and Devonian structures has been rewarded mainly with oil pays in the Devonian Richfield interval. Indications of gas shows from the Ordovician Trenton-Black River Formation in north central Michigan has generated renewed interest in finding more production from fractured carbonate rocks in this prolific producing interval.

Oil and gas drilling activity in the Illinois portion of the Illinois basin almost doubled in 1980 from a comparable period in 1979. The increased drilling does not appear to be the result of any particular "play" but rather of infill drilling and the extension of production in old areas. The trend has been to deeper drilling in established producing areas where wells have been deepened to test mainly the Mississippian Salem and Warsaw Formations. In some cases excellent wells have been found by deepening to the Devonian Dutch Creek Formation. The new production, which has been entirely oil with very little associated gas, has been concentrated in southeastern Illinois in Wayne and White Counties.

In the Indiana portion of the Illinois basin, oil and gas drilling activity increased in 1980 over 1979. The activity has been concentrated in southwestern Indiana where deeper drilling to the limestones and sandstones of the Mississippian has resulted in mainly oil production with very little associated gas.

Exploration in the Forest City basin has been confined to the west central Missouri area where 500 wells have been permitted to test for shallow heavy oil in the Pennsylvanian Cherokee and Blue Jacket Formations. Oil production is expected to double from 90,000 barrels produced during 1979, however, there has been no metered gas production.

Table 6 — Area C. North Central United States
Minnesota, Wisconsin, Michigan, Iowa, Illinois, Indiana, and Missouri
(trillion cubic feet)

Onshore (Drilling Depth)	Probable	Possible	Speculative
less than 15,000 feet	—	2	1
15,000 to 30,000 feet	—	—	—
Area C total	—	2	1

Area D: Arkansas, North Louisiana, and Central Texas (RR Comm. Dists. 5, 6, 7B and 9)

From the standpoint of prospective areas, Area D includes the North Louisiana, East Texas, Fort Worth and Hardeman geologic basins as well as the southern part of Arkansas, south of the Ouachita System forelands. The estimate of potential supply of natural gas remains essentially unchanged compared to the report of 12/31/78. The estimates have been increased by 1 Tcf in the Probable category and 2 Tcf in the Possible category, but decreased by 2 Tcf in the Speculative category.

In the past two years there have been significant discoveries in the Fort Worth basin and in the Smackover Formation along the Louisiana-Arkansas state border. These discoveries and additional geologic and drilling information have led to re-evaluation of the potential supply and to shifts from the Speculative category and increases in the Possible and Probable categories. Discoveries have also resulted in the shift of some former potential supply into proved reserves.

The estimates of potential supply also include some resources which are believed to occur in the tight formations of the Travis Peak and Cotton Valley, especially in the East Texas basin. Some of this estimated potential probably falls within the current definition of tight formations of the Federal Energy Regulatory Commission.

Table 7 — Area D. Arkla-Tex
Arkansas, North Louisiana, and Central Texas
(RR Comm. Dists. 5, 6, 7B & 9)
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	9	22	16
15,000 to 30,000 feet	—	—	4
Area D total	9	22	20

Area E: South Louisiana and Offshore Louisiana

Area E consists of the onshore area of south Louisiana and the offshore area of Louisiana out to a water depth of 1,000 meters. The estimate of potential supply of natural gas from Area E has been decreased by 17 Tcf from the estimate of 12/31/78. The new estimate of the total potential supply for this area is 81 Tcf.

About one-third of the decrease in estimates is related to transfers from potential supply to proved reserves in this actively developing area. The net result of evaluation of new data and reappraisal of earlier estimates accounts for the remainder of the decrease.

Although the net results of re-evaluation of this area have been a decrease in the estimates of potential supply, one part of the Area has been estimated to have a greater potential than was estimated for previous reports. This is the deep Tuscaloosa trend which extends in a belt approximately 20 miles wide and 300 miles long from Texas to Mississippi across the northern portion of south Louisiana. The Tuscaloosa trend, in which the exploratory target is the lower Tuscaloosa Formation of Cretaceous age and probable deltaic origin, is still supporting active exploratory activity even after five years of furious drilling activity. The success ratio has dropped, however, from nearly 100% initially to 20% in 1980. Most of the discoveries to date have been concentrated in the center of the trend near Baton Rouge on what has been termed the "mega structure", a structural complex 20 miles long and 15 miles wide. The ultimate potential of this trend is not yet completely evaluated, but it appears significant.

Area E has produced approximately 25% of the total cumulative U.S. gas production and is presently producing about 35% (7 Tcf in 1979) of the current U.S. production.

Table 8 — Area E. South Louisiana and adjacent offshore
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	3	5	—
15,000 to 30,000 feet	3	11	—
Total	6	16	—
Offshore (Water Depth)			
less than 200 meters	18	27	—
200 to 1,000 meters	1	13	—
Total	19	40	—
Area E total	25	56	—

Area G: Texas Gulf Coast and South Texas (RR Comm. Dists. 1, 2, 3 and 4) and Adjacent Offshore

Area G includes south Texas and the Texas Gulf Coast, both onshore and offshore. The estimate of total potential supply for this Area has been reduced by 16 Tcf from the estimate of 12/31/78. This reduction in the estimates consists of 3 Tcf each in the onshore and offshore Probable category, 4 Tcf in the onshore Possible category and 6 Tcf in the offshore Possible category. There is no change in the estimate of Speculative potential. The changes are the net result of re-evaluation of the Area where considerable information is now available and transfers of discoveries from potential resources to proved reserves. About one-eighth of the decrease is related to transfers to proved reserves.

The main area of exploratory and drilling activity onshore in Area G is the Austin Chalk (Upper Cretaceous) play in the Giddings field area which stretches through Fayette, Lee and Burleson Counties. Offshore, several wells have been drilled to depths below 15,000 feet in the Brazos area.

Table 9 — Area G. Texas Gulf Coast and South Texas
(RR Comm. Dists. 1, 2, 3 & 4) and adjacent offshore
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	13	15	2
15,000 to 30,000 feet	2	3	2
Total	15	18	4
Offshore (Water Depth)			
less than 200 meters	14	12	—
200 to 1,000 meters	1	5	—
Total	15	17	—
Area G total	30	35	4

Area H: North and South Dakota, Nebraska, Montana, Wyoming, Idaho, Colorado, and Utah

Area H comprises the Rocky Mountain states and adjacent High Plains areas. The boundary of this area, and the adjacent Area L, have been modified with this report to place the State of Idaho in Area H. This change has been made in order to emphasize the close relationship of the geology of eastern Idaho to the Rocky Mountain area in general and because of the strong possibility of gas occurrences in Idaho similar to those in the currently developing Western Thrust Belt in Wyoming and Utah. Adjustments in the estimates in some comparative tables have been made to reflect this change.

Estimates of the natural gas potential for Area H have been increased from the 12/31/78 estimates by 17 Tcf in the Probable category and 6 Tcf in the Speculative category. The estimates for the Possible category have been reduced by 11 Tcf. This is a net increase of 12 Tcf overall.

Changes in the Probable category were made as a result of new evaluations, particularly in the Green River, Uinta, Piceance and Wind River basins. Decreases in the Possible category were largely the result of transfers from the Possible to the Probable category in the Wind River basin and re-evaluation and some transfer from Possible to Probable and proved reserves in the Central Thrust Belt. The increase in the Speculative category is the net result of additions in Montana and the Green River basin and re-evaluation and transfers to other categories in the Thrust Belt.

Considerably more information is now available upon which to base the estimate of the potential gas resources in the Western Thrust Belt than was available at the time of preparation of the estimate of 12/31/78. The estimates for the Probable category are now quite firm because of new discoveries and new geologic and engineering data. The estimates for Possible and Speculative categories are, of course, less assured than those for the Probable category, but are still much firmer than in 1978. The estimates are increased by 3 Tcf in the Probable category and decreased 9 Tcf in the Possible category and 6 Tcf in the Speculative category. Additions to proved reserves, as well as careful re-evaluation based on new data, have resulted in the changes. Also, shifts in the postulated depth of occurrence of the resource have been made based on new data. All of the estimated Probable potential is considered to be in the Central Thrust Belt along with most of the Possible potential and much of the Speculative potential. A large part of the Speculative potential in the Central Thrust is believed to lie in sub-thrust beds of Permian and Cretaceous age. Some Possible and Speculative potential is considered to lie in both the northern and southern parts of the Thrust Belt.

The estimates for the Western Thrust Belt are:

	Probable (Tcf)	Possible (Tcf)	Speculative (Tcf)
Less than 15,000 ft. drilling depth	5	18	17
Greater than 15,000 ft. drilling depth	4	18	26
	9	36	43

Total potential supply: 88 Tcf

Current drilling and development in the Wind River, Green River, and Uinta and Piceance basins includes some gas from tight formations which fall within current Federal Energy Regulatory Commission definitions of gas from tight formations. Some potential resources included in the Potential Gas Committee's estimates for these same basins would also fall within some definitions of gas from tight formations.

In the Wind River, Big Horn, Powder River, Green River and Uinta-Piceance basins, a few to several percent of the total land area is withdrawn from petroleum exploration due to governmental restrictions, but most or all of the withdrawn area may contain potential gas supply. Therefore, within these basins a small percentage of the estimated potential supply is affected. In the central and northern segments of the Western Thrust Belt, large parts (up to 50%) are included in withdrawn areas and, therefore, a large percentage of the estimated potential supply may be affected.

Table 10 — Area H. Northern Rocky Mountains
North and South Dakota, Nebraska, Montana, Wyoming, Idaho, Colorado, and Utah
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	30	49	29
15,000 to 30,000 feet	10	29	40
Area H total	40	78	69

Area I: Arizona and New Mexico

The estimates of potential gas supply for Area I have not changed appreciably during the past two years. Exploratory drilling has been minimal, with the greatest drilling emphasis being the infill of the Dakota and Mesaverde Formations in the San Juan basin.

The results of the exploratory drilling which has occurred have been negative. A wildcat test in the Rio Grande rift some 12 miles south of Albuquerque has been plugged and abandoned at a depth of 25,000 feet. However, the operator is planning another test to be drilled some distance northwest of Albuquerque to an estimated total depth of 19,700 feet.

Phillips Petroleum Company recently completed the drilling of a frontier effort, the Arizona State A-No. 1, Pinal County, to test the possible extension of the Western Thrust Belt into southern Arizona. Granite was entered at about 4,000 feet and drilling was terminated at a depth of approximately 18,000 feet still in the granite, and no hydrocarbon shows were encountered. It was hoped the well would penetrate the granite and reach younger sedimentary rocks below. The drilling rig will be moved to a site about 4 miles east of Tombstone, Arizona, where another deep exploratory well will be drilled.

Table 11 — Area I. Southern Rocky Mountains
Arizona and New Mexico
(trillion cubic feet)

Onshore (Drilling Depth)	Probable	Possible	Speculative
less than 15,000 feet	2	3	1
15,000 to 30,000 feet	—	—	—
Area I total	2	3	1

Area J-North: Mid-Continent (Kansas, Oklahoma, and Texas RR Comm. Dist. 10)

There are decreases in the estimates of potential supply for all categories in Area J-North compared to the estimates for 12/31/78. The total decrease in estimates amounts to 8 Tcf, most of which is accounted for by transfers from potential supply to proved reserves.

Exploratory activity is high in all parts of Area J-North, especially in the deep part of the Anadarko basin. At year-end 1980 there were about 350 locations which were either drilling to below 15,000 feet or had been projected to drill below 15,000 feet. Of these, over 50 were tests to 20,000 feet or deeper and four were projected to 26,000 feet or deeper. The overall deep drilling activity was running 75% ahead of the record pace set in 1979.

Approximately a third of this drilling activity was targeted toward Springer (Mississippian/Pennsylvanian) sand objectives. Early results indicate that by the next report much of the potential supply allocated to these zones will be transferred from the Possible category to the Probable category and proved reserves.

Table 12 — Area J-North. Mid-Continent
Kansas, Oklahoma, and Texas RR Comm. Dist. 10
(trillion cubic feet)

Onshore (Drilling Depth)	Probable	Possible	Speculative
less than 15,000 feet	18	27	5
15,000 to 30,000 feet	9	39	37
Area J-North total	27	66	42

Area J-South: Permian Basin (S.E. New Mexico, Chaves, Eddy, Lea & Roosevelt Cos. and Texas RR Comm. Dists. 7C, 8 and 8A)

The estimates of the potential gas resource for Area J-South have been reduced in the Possible category, both shallow and deep, by 2 Tcf compared with the estimates of 12/31/78. All of this decrease can be accounted for by transfers from potential resources to proved reserves.

Over the past five years up to 1979, additions to proved reserves have averaged about 0.75 Tcf per year. In 1979, additions to proved reserves totaled slightly more than 1.5 Tcf. Estimates of additions to proved reserves for 1980 are not available at the time of printing.

Table 13 — Area J-South. Permian Basin
(S.E. New Mexico, Chaves, Eddy, Lea & Roosevelt Cos.
and Texas RR Comm. Dists. 7C, 8 & 8A)
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	8	19	1
15,000 to 30,000 feet	8	15	—
Area J-South total	16	34	1

Area K: Alaska and Adjacent Offshore

The 1980 estimates of potential gas resources for Alaska are approximately 30% lower than those reported in 1978. The 1978 and 1980 figures are summarized below:

	Probable (Tcf)	Possible (Tcf)	Speculative (Tcf)
1980	8	29	108
1978	13	40	136

This downward trend in estimates is not surprising, considering the nature of exploration in such a vast frontier as Alaska, a state of 357 million acres on land and another 380 million acres between the shoreline and the 1,000-meter water depth. In the late 1960's when the Potential Gas Committee first started making estimations in Alaska, little was known about the limits of the sedimentary basins and their hydrocarbon potential. Optimism overshadowed the lack of data.

Alaska is still in a frontier mode, but there are better interpretations now about both limits and potentials. Recent seismic work and wildcat drilling have diminished what was earlier considered to be prospective acreage, for example, portions of the Arctic basin, the Gulf of Alaska and the Lower Cook Inlet. Negative results of exploratory activity in the Kodiak area and Northern Gulf of Alaska have also resulted in reduction of estimates of potential gas resources.

A number of wildcat wells have been drilled recently in the National Petroleum Reserve-Alaska, but this area is still considered to contain potential for development of gas resources. There are a number of large areas like the Bering Sea, Arctic Wildlife Refuge, Norton basin and Chukchi Sea that, as yet, have never been drilled for oil or gas. These frontier areas could hold unknown potential as could portions of such already partially drilled areas as the Arctic and Cook Inlet basins.

Table 14 — Area K. Alaska and adjacent offshore
(trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	6	16	28
15,000 to 30,000 feet	—	—	—
Total	6	16	28
Offshore (Water Depth)			
less than 200 meters	2	13	68
200 to 1,000 meters	—	—	12
Total	2	13	80
Area K total	8	29	108

Area L: California, Nevada, Pacific Northwest (excluding Idaho), and Adjacent Offshore

Area L includes the Pacific Coast states, onshore and offshore, and the State of Nevada, Idaho, which was formerly included in the estimates for Area L, is now included in Area H. Estimates for Area L remain essentially the same as for 12/31/78 in the Probable and Possible categories when the transfer of Idaho potential is taken into account. There is a slight increase (2 Tcf) in the estimate of the onshore potential, both deep and shallow.

Exploration activity in the onshore California basins remained at relatively low levels in the past two years except for the Sacramento Valley. In the Sacramento Valley the most significant developments were at South Oakley, deeper zones at North Lindsey Slough and extensions of production south of Grimes in the College City area. There were also a large number of extensions and lesser new field discoveries, some of which could become more significant with additional development. Deeper exploration in the Southern San Joaquin Valley continues and more activity is scheduled for the future. This remains one of the more eagerly sought objectives on the west coast. Other onshore basins in California had only limited exploration activity with new gas largely limited to solution gas associated with new oil discoveries.

The discovery of the Mist field in Columbia County gave Oregon its first production of natural gas. This discovery, made in 1979, has produced an increase in drilling in nearby areas as well as in other basins in Oregon and some in Washington. There has been an even greater land play in both states and the pace of exploration will increase in the next few years. Additional discoveries are a reasonable expectation. The increase in the Speculative category is a result of the initial discovery of gas in Oregon. The significance of this discovery is not yet great enough to make a measurable change in the Probable and Possible categories.

In the offshore area, exploration drilling on the tracts awarded in the 1979 OCS sale has been slow in getting underway because of governmental permit delays and no discoveries have been announced to date. Considerable seismic activity has taken place in the offshore Santa Maria area in anticipation of a proposed OCS sale. As a result of discoveries made on tracts from earlier sales in the eastern Santa Barbara Channel and the San Pedro Bay areas, some gas was transferred to proved reserves.

Table 15 — Area L. California, Nevada, Pacific Northwest (excluding Idaho), and adjacent offshore (trillion cubic feet)

	Probable	Possible	Speculative
Onshore (Drilling Depth)			
less than 15,000 feet	3	6	12
15,000 to 30,000 feet	1	3	3
Total	4	9	15
Offshore (Water Depth)			
less than 200 meters	—	4	4
200 to 1,000 meters	—	4	5
Total	—	8	9
Area L total	4	17	24

In Retrospect and Prospect

As for all resources occurring in the crust of the earth, the absolute volume of natural gas ultimately recoverable is a specific but unknown quantity. It should be recognized that changes in estimates of the potential supplies from time to time do not actually increase or decrease the ultimately recoverable volume. Such changes reflect improvements in estimating techniques and increased basic knowledge of the occurrence of natural gas at the time of the estimate. It must also be recognized that any estimate of potential supply lacks the accuracy of the estimates of proved recoverable reserves.

Economic, technological and governmental factors do not change the absolute volume of ultimately recoverable natural gas. Such factors, however, do influence the estimates of the potential supply in that they may increase or decrease the amount of gas which the estimator feels are within the limits of economic and technological feasibility. These factors may further influence the timing and rate of development of natural gas resources.

In each succeeding study by the Potential Gas Committee, the impact of new technology has been considered. In the first study of 1964, offshore drilling was limited to water depths of 300 feet. In 1966, this limit was increased to 600 feet, and in 1968, the water depth was increased further to 1,500 feet. Drilling depths were increased also, from 25,000 to 30,000 feet, in the 1968 report. The parameters of maximum drilling depth of 30,000 feet and 1,500 feet water depth were used for the 1970, 1972, and 1976 reports. The parameters for the 1978 and 1980 publications retain the onshore maximum drilling depth of 30,000 feet. In offshore areas, separate estimates are made for resource potential existing beneath water depths of 0 to 200 meters (656 feet) and 200 to 1,000 meters (3,281 feet). All potential supply estimates represent most likely volumes. The effects of newly developed technology will continue to be considered in future studies.

Table 16 summarizes the estimates of potential supply which have been given in each of the Potential Gas Committee reports.

Changes in estimates in each of the categories represent re-evaluation based on additional drilling. As drilling progresses, gas volumes estimated to be in a particular reservoir will move from one category to another as shown schematically in figure 18. Since any projection of potential supply lacks the accuracy of proved reserve figures, particularly in the Speculative category, it must be recognized that these estimates of potential supply will be subject to upward and downward revisions as new geological and engineering data are provided by exploratory drilling.

Table 16 — Comparison of estimates of potential supply of natural gas from Potential Gas Committee reports (trillions of cubic feet at 14.73 psia and 60° F.)

	Probable	Possible	Speculative	Total
Lower 48 States				
As of 12-31-66	300	210	180	690
As of 12-31-68	238	317	245	800
As of 12-31-70	218	326	307	851
As of 12-31-72	212	290	278	780
As of 12-31-76	192	318	188 to 238	698 to 748
As of 12-31-78	186	359	285	830
As of 12-31-80	185	329	254	768
Total United States (including Alaska)				
As of 12-31-68	260	335	632	1,227
As of 12-31-70	257	387	534	1,178
As of 12-31-72	266	384	496	1,146
As of 12-31-76	215	363	345 to 395	923 to 973
As of 12-31-78	199	399	421	1,019
As of 12-31-80	193	358	362	913

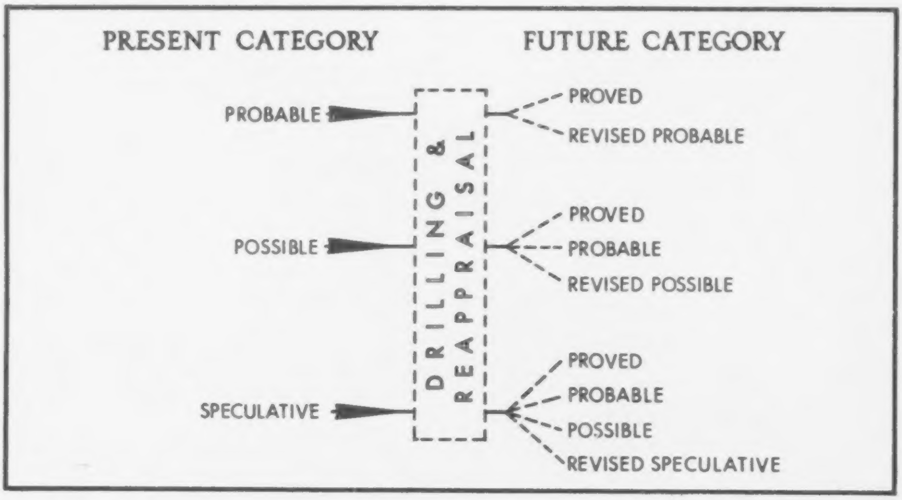
PRESENT CATEGORY
FUTURE CATEGORY
PROBABLE
POSSIBLE
SPECULATIVE
DRILLING &
REAPPRAISAL
PROVED
REVISED PROBABLE
PROVED
PROBABLE
REVISED POSSIBLE
PROVED
PROBABLE
POSSIBLE
REVISED SPECULATIVE

Figure 18—Schematic representation of progression of potential gas supplies as a result of drilling and reappraisal

Tables 17 through 20 contain estimates of potential for each Area broken out by drilling depth increments and by offshore water-depth divisions.

Table 17 — Estimated potential supply of natural gas in United States as of December 31, 1980

Onshore, 0-15,000 feet drilling depth
(trillions of cubic feet at 14.73 psia and 60° F.)

Area	Probable	Possible	Speculative
A	26	9	24
B	4	4	3
C	—	2	1
D	9	22	16
E	3	5	—
G	13	15	2
H	30	49	29
I	2	3	1
J-North	18	27	5
J-South	8	19	1
L	3	6	12
48 States Subtotal	116	161	94
K Alaska	6	16	28
Total less than 15,000 feet Drilling Depth Onshore United States	122	177	122

Table 18 — Estimated potential supply of natural gas in United States as of December 31, 1980

Onshore, 15,000-30,000 feet drilling depth
(trillions of cubic feet at 14.73 psia and 60° F.)

Area	Probable	Possible	Speculative
A	—	—	11
B	2	3	5
C	—	—	—
D	—	—	4
E	3	11	—
G	2	3	2
H	10	29	40
I	—	—	—
J-North	9	39	37
J-South	8	15	—
L	1	3	3
48 States Subtotal	35	103	102
K Alaska	—	—	—
Total 15,000 to 30,000 feet Drilling Depth Onshore United States	35	103	102

Table 19 — Estimated potential supply of natural gas in United States as of December 31, 1980

Offshore, 0-200 meters water depth
(trillions of cubic feet at 14.73 psia and 60° F.)

Area	Probable	Possible	Speculative
A	—	—	11
B	—	—	20
C	—	—	—
D	—	—	—
E	18	27	—
G	14	12	—
H	—	—	—
I	—	—	—
J-North	—	—	—
J-South	—	—	—
L	—	4	4
48 States Subtotal	32	43	35
K Alaska	2	13	68
Total less than 200 meters Water Depth Offshore United States	34	56	103

Table 20 — Estimated potential supply of natural gas in United States as of December 31, 1980

Offshore, 200-1,000 meters water depth
(trillions of cubic feet at 14.73 psia and 60° F.)

Area	Probable	Possible	Speculative
A	—	—	5
B	—	—	13
C	—	—	—
D	—	—	—
E	1	13	—
G	1	5	—
H	—	—	—
I	—	—	—
J-North	—	—	—
J-South	—	—	—
L	—	4	5
48 States Subtotal	2	22	23
K Alaska	—	—	12
Total 200 to 1,000 meters Water Depth Offshore United States	2	22	35

PART II

REPORT OF THE POTENTIAL GAS AGENCY

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REPORT OF THE POTENTIAL GAS AGENCY

Evaluation by Potential Gas Agency

—Harry C. Kent, Director
Potential Gas Agency, Colorado School of Mines

The accompanying report by the Potential Gas Committee (PGC) is the eighth estimate of the potential supply of natural gas in the United States made by the Committee and the seventh published by the Potential Gas Agency (PGA) of the Colorado School of Mines. The estimates contained in this report have been prepared by members of the Potential Gas Committee working through their Area Work Committees and reviewed at the regional and national level by the entire Potential Gas Committee. The Potential Gas Agency has acted to guide and assist the work of the Potential Gas Committee and to assure that professional standards and objectivity were maintained during the preparation of the estimates.

A report on the potential resources of natural gas from nonconventional sources is included in Part II of this publication. It represents a review of the information available to the Potential Gas Agency to the time of publication. It is not an independent evaluation of the potential of these resources by either the Potential Gas Committee or the Potential Gas Agency but it is an attempt to consolidate a brief review of potential nonconventional resources of natural gas currently being investigated in this country. This report was prepared in the offices of the Potential Gas Agency by James C. Donaldson and James J. Emme, and it was reviewed by a number of experts in the respective fields who are credited at the beginning of the report.

A second report, and a new addition to the biennial reports on potential supply of natural gas in the United States, is a review of the potential resources of conventional natural gas in Canada. This review was prepared by Donald W. Axford and A. A. Wilkins, who are the Canadian observers to the Potential Gas Committee, and is included in Part III of the report. Data contained in the review are taken entirely from Geological Survey of Canada Open-File Release No. 767, prepared by R. M. Procter, P. J. Lee and D. N. Skibo and released in March 1981.

DUTIES AND RESPONSIBILITIES OF POTENTIAL GAS AGENCY

The Potential Gas Agency is charged with approving the criteria and methods used by the Potential Gas Committee and insuring that these are followed and maintained in preparing estimates and reports; the object being to maintain the highest scientific standards and objectivity. The Agency also acts to assure that there is an adequate representation of qualified personnel from many different segments of the natural gas industry and governmental and academic sectors. The Agency appoints the Chairman and Vice Chairman of the Potential Gas Committee and approves the appointment of other members to the Committee.

The Agency is sponsored by the American Gas Association through a grant to the Colorado School of Mines. The School of Mines, in turn, is responsible for selecting the Director and other personnel of the Agency and conducting the affairs of the Agency in a professional manner. Guidance for the PGA is provided by the Gas Supply Committee of the American Gas Association, which is responsible for the setting of general policy and objectives and financing of the study.

ORGANIZATION AND OPERATION OF POTENTIAL GAS COMMITTEE

There is no direct link between the Gas Supply Committee of the American Gas Association and the Potential Gas Committee. All contact is through the Potential Gas Agency. One of the duties of the Agency is to see that separation is maintained. The significance of this separation is that the Gas Supply Committee does not, in any way, enter into the deliberations nor influence the estimates which are prepared by the PGC.

Membership of the Potential Gas Committee is drawn from both large and small exploration and production companies, consultants, state geological surveys, and academic institutions. Most of the members are geologists and engineers. Observers from a number of Federal agencies and various associations are also included in the committee membership. For administrative purposes, the United States is divided into three regions (East, Central and West) and into 12 Work Areas. Each of the Work Areas has a Chairman, whose appointment must be approved by the Potential Gas Agency, and who reports to a Regional Vice Chairman. The Work Area Committees must also include at least one representative each from the pipeline and distribution segments of the natural gas industry in order to assure broad representation of all interests.

Each Area Work Committee functions independently. Its members are charged with gathering all available information about the geology and occurrence of natural gas in the assigned area. The members review past exploration and production history and, based on the historic record and their collective geological and operating expertise, evaluate the potential for further discoveries in both partially explored and unexplored basins.

The procedures for arriving at the estimates of potential supply are outlined in detail in Part I of this report. The Director and other staff members of the Potential Gas Agency have met with Area Work Committees and have observed their operation. It is the conclusion of the Agency that the Area Work Committees have followed the standards adopted by the Potential Gas Committee, as outlined in Part I, in preparing their estimates.

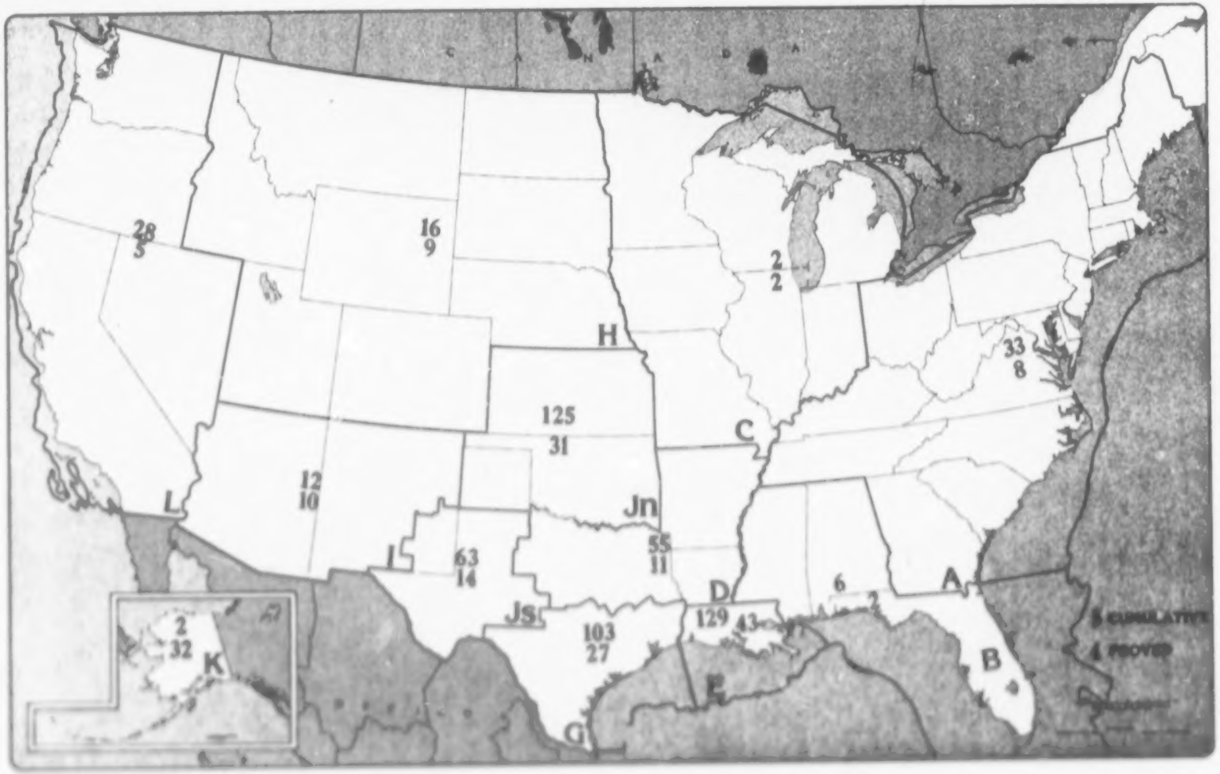
Because of the nature of the work involved, it is not always possible to achieve complete uniformity in the work of all of the Area Committees. In some areas, there is a great deal of geologic knowledge and the area is in a reasonably mature stage of exploration. In other areas, exploration has only begun and there is relatively little basic geologic information. In spite of these differences, in the opinion of the Potential Gas Agency, the work of the Committee has been conducted in a sound and scientific manner.

Although the only way in which the estimates of the Committee can be proved or tested is by drilling prospective areas, the variety of background of individuals working on the Committee and the discussion and review which have occurred at both the area and national levels have resulted in a consensus. Over the past 17 years several hundred qualified professionals have participated in the work of the Potential Gas Committee. The consistency of the results of these investigations within the parameters set by the Committee is notable. Although there may be differences of opinion as to the potential in limited local areas or basins, the resulting figures are reasonable estimates when reported as composite figures for Potential Gas Committee reporting areas.

REVIEW OF PROVED RESERVES AND POTENTIAL SUPPLY

As emphasized in the report of the Potential Gas Committee, the estimates presented by this Committee are of potential supply which is in addition to proved reserves. In order to gain a total perspective of the potential ultimately recoverable volume of natural gas in the United States, it is necessary to consider the total of cumulative past production, present proved reserves, and future supply. Cumulative natural gas production for each of the PGC reporting areas, taken from the published report of the Committee on Natural Gas Reserves of the American Gas Association as of December 31, 1979, is shown in figure 19. Also shown in figure 19 are estimates of proved natural gas reserves for each of the Potential Gas Committee reporting areas, based on estimates published by the A.G.A. Committee on Natural Gas Reserves as of December 31, 1979. Estimates of cumulative production and proved reserves for year-end 1980 are not available at the date of publication.

The report of December 31, 1979 prepared by the Committee on Natural Gas Reserves of the American Gas Association was the last report prepared by that committee following the procedures of past years and published jointly with reports of the American Petroleum Institute and the Canadian Petroleum Association. In February 1980 the first of a new series of reports on U.S. Crude Oil and Natural Gas Reserves was issued by the Office of the Oil and Gas Information System, Energy Information Administration, U.S. Department of Energy. This report compiled estimates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32
K
5 CUMULATIVE
4 PROVED

Figure 19—Geographic distribution of cumulative natural gas production and proved natural gas reserves as of December 31, 1979

of U.S. proved reserves of crude oil and natural gas based on data submitted to the Department by selected oil and gas well operators as of December 31, 1977. A second report in this series, reporting estimates of proved reserves of crude oil and natural gas as of December 31, 1978, was issued in September 1980. This series of reports by the Department of Energy is intended to replace the reports of the American Gas Association and the American Petroleum Institute.

All subsequent comparisons between the PGC's estimate of potential supply as of December 31, 1980 and the cumulative production and proved reserves data as of December 31, 1979 must be made with difference in reporting dates in mind. Based upon historical trends, it may be assumed that cumulative production figures for 1980 will be approximately 19 Tcf greater than those for 1979 presented here, while proved reserves will possibly decline relative to the 1979 estimates.

Estimates of ultimately recoverable volume, including the future potential estimated by the Potential Gas Committee plus past production and present proved reserves, have remained consistent considering the modifications to limiting parameters which have been made throughout the years. (See table 21.) The consistent total of ultimately recoverable volume reflects the fact that quantities of natural gas have been developed regularly from potential supply through exploration and drilling into proved reserves and ultimately into production. (Table 22 summarizes the ultimately recoverable volumes of natural gas in the United States by PGC reporting areas.)

The estimate of ultimately recoverable volume for the total United States, as of year-end 1980, is lower than the estimate for year-end 1978. This lower estimate reflects the net result of (1) transfers of volumes of natural gas from potential supply to proved reserves and production and (2) increases and decreases in estimates due to re-evaluation of the potential based on newly available geological, geophysical and engineering data. About one-third of the nationwide decrease in estimated potential is probably the result of transfers from potential supply to reserves and production. The areas of major decreases due to re-evaluation of estimates of natural gas potential are the U.S. Atlantic offshore region, especially the area of the Baltimore Canyon (Area A), south Louisiana onshore and offshore, except the deep Tuscaloosa trend (Area E), the Texas Gulf Coast and south Texas onshore and offshore (Area G) and Alaska (Area K). The areas of major increases in estimates of potential resources are the Eastern Overthrust Belt (Area A), the deep Tuscaloosa trend (Area E), and the Green River, Uinta, Piceance and Wind River basins, and Montana (Area H). More details of these re-evaluations are given in the various area reports.

In the past two years, the level of exploratory drilling activity in the United States has continued a pattern of significant annual increases which has prevailed for the past few years. Table 23 summarizes the number and footage of exploratory wells drilled for each of the years from 1972 through 1980. Estimates for the total number of exploratory wells drilled in the United States indicate that approximately 1,400 more exploratory wells were drilled in 1980 than were drilled in 1979 and approximately 1,200 more in 1980 than in 1978. The average depth of exploratory wells decreased from 5,923 feet in 1978 and 5,958 feet in 1979 to 5,870 feet in 1980. The increase in exploratory drilling activity can certainly be correlated to increased emphasis on natural gas and oil exploration coupled with the changes in regulatory climate and the improved economic situation. The exploration industry seems to be responding well to the initiation of phased deregulation of gas prices, to price incentives for certain types of gas, and to increases in the price of oil.

The year 1973 marked a low point in the level of exploratory drilling activity in the total country. Since then, exploratory drilling has increased almost annually both in the number of wells drilled and in the total footage drilled. Overall, the number of exploratory wells drilled has increased in 1980 by 77% over the number of wells drilled in 1973. The average well depth was shallowest in 1976 (5,719 feet) and increased to a record level of over 5,900 feet in 1978 and 1979 and dropped again in 1980 to slightly less than 5,900 feet (table 23).

Although there were significant nationwide increases in exploratory drilling activity, the increases were not uniformally spread across the total United States (table 24). All of the Potential Gas Committee areas, except Areas E, G and J-North, experienced an increase in the total number of exploratory wells drilled and in the total exploratory footage drilled in 1980 compared to 1978. Areas E and G showed a decrease in both categories. Area J-North showed a decrease in number of wells drilled but an increase in footage drilled. On a percentage basis, Area I experienced the greatest percentage increase in the number of exploratory wells drilled. In terms of increase in the absolute number of exploratory wells drilled, Area D had the greatest increase.

Total drilling activity (table 25), including both development and exploratory wells, has increased even more sharply since 1973 than the number of exploratory wells. In 1973, 26,592 total wells were drilled in the United States. Data for 1980 indicate that 62,462 wells were drilled, representing a total drilled footage of almost 289 million feet. The 1980 number of wells is a 135% increase over the number drilled in 1973. All of the drilling statistics indicate a strong and active effort to develop those resources which have already been discovered and to search for new gas and oil resources.

Table 21 — Comparison of estimates of ultimately recoverable volumes of natural gas in United States for period December 31, 1966 to December 31, 1980 (trillions of cubic feet at 14.73 psia and 60° F.)

	(a)	(b)	(c)	(d)	(e)
	PREVIOUSLY DISCOVERED				
	Cumulative Production*** (excluding gas currently in underground storage)	Proved Reserves (including gas currently in underground storage)	Production plus Reserves (a + b)	POTENTIAL SUPPLY (total of Probable, Possible and Speculative categories)	ESTIMATE OF ULTIMATELY RECOVERABLE VOLUME (c + d)
Lower 48 States					
As of 12-31-66	307	286	593	690	1,283
As of 12-31-68	344	282	626	800	1,426
As of 12-31-70	387	260	647	851	1,498
As of 12-31-72	431	235	666	780	1,446
As of 12-31-76	514	184	698	698 to 748	1,396 to 1,446
As of 12-31-78	551	169	720	830	1,550
As of 12-31-80	571*	163*	734*	768	1,502
Total United States**					
As of 12-31-68	345	287	632	1,227	1,859
As of 12-31-70	387	291	678	1,178	1,856
As of 12-31-72	432	266	698	1,146	1,844
As of 12-31-76	515	216	731	923 to 973	1,654 to 1,704
As of 12-31-78	553	200	753	1,019	1,772
As of 12-31-80	573*	195*	768*	913	1,681

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*Cumulative production and proved reserves estimates are year-end 1979 estimates of the A.G.A. Committee on Natural Gas Reserves; 1980 data not available at the time of compilation.

**Alaska not estimated as of 12-31-66.

***Cumulative production adjusted to reflect most current available estimates.

Table 22 — Summary of ultimately recoverable volumes of natural gas in the United States by geographic areas as of December 31, 1980* (trillions of cubic feet at 14.73 psia and 60° F.)

	(a)	(b)	(c)	(d)			(e)
	PREVIOUSLY DISCOVERED—1979						
	Cumulative Production*** (excluding gas currently in underground storage)	Proved Reserves (including gas currently in underground storage)	Production plus Reserves (a + b)	POTENTIAL SUPPLY—1980			ESTIMATE OF ULTIMATELY RECOVERABLE VOLUME (c + d)
Area				Probable	Possible	Speculative	
A	33	8	41	26	9	51	127
B	6	2	8	6	7	41	62
C	2	2	4	—	2	1	7
D	55	11	66	9	22	20	117
E	129	43	172	25	56	—	253
G	103	27	130	30	35	4	199
H	16	9	25	40	78	69	212
I	12	10	22	2	3	1	28
J-North	125	31	156	27	66	42	291
J-South	63	14	77	16	34	1	128
L	28	5	33	4	17	24	78
Lower 48 States Subtotal	571**	163**	734**	185	329	254	1,502**
K-Alaska	2	32	34	8	29	108	179
Total United States	573**	195**	768**	193	358	362	1,681**

---

*Cumulative production and proved reserves estimates are year-end 1979 estimates of the A.G.A. Committee on Natural Gas Reserves; 1980 data not available at the time of compilation.

**Area estimates do not add to national totals because of rounding.

***Cumulative production adjusted to reflect most current available estimates.

Table 23 — Exploratory wells — total United States
(data from API Quarterly Review of Drilling Statistics)

	Number of Exploratory Wells Drilled	Footage	Average Well Depth
1972	7,539	45,043,798	5,975
1973	7,466	44,776,906	5,997
1974	8,619	50,261,744	5,832
1975	9,214	53,846,303	5,844
1976	9,234	52,812,406	5,719
1977	9,961	57,654,874	5,788
1978	10,677	63,234,745	5,923
1979	10,484	62,467,188	5,958
1980	11,916	69,948,320	5,870

Table 24 — Number of exploratory wells drilled, footage drilled, and average depth of wells — 1978 and 1980
(data from API Quarterly review of Drilling Statistics)

	1978			1980		
Area	No. of Wells	Footage	Average Well Depth	No. of Wells	Footage	Average Well Depth
A	862	2,189,177	2,540	963	2,477,501	2,573
B	326	2,873,439	8,814	365	3,191,595	8,744
C	805	2,549,094	3,166	1,104	3,332,148	3,018
D	1,578	7,898,646	5,005	2,060	10,517,328	5,106
E	520	6,374,356	12,258	465	5,863,586	12,610
G	1,870	13,374,429	7,152	1,744	13,019,459	7,465
H	1,734	10,988,116	6,336	1,922	12,340,162	6,420
I	45	171,021	3,800	89	300,816	3,380
J-N	1,673	8,300,895	4,962	1,654	8,539,880	5,163
J-S	861	5,945,680	6,906	1,072	7,282,727	6,794
K	13	128,542	9,888	18	190,543	10,586
L	383	2,362,126	6,167	444	2,723,247	6,133
Total U.S.*	10,677	63,234,745	5,923	11,916	69,948,320	5,870

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*Includes Gulf of Mexico-Northern.

Table 25 — Drilling activity summary — 1973-1980
(data from API Quarterly Review of Drilling Statistics)

	Exploratory Wells		Total Wells	
	Number	Million Feet	Number	Million Feet
1973	7,466	44.8	26,592	136.4
1974	8,619	50.3	31,698	150.6
	15% increase over 1973		19% increase over 1973	
1975	9,214	53.8	37,235	174.4
	7% increase over 1974		17% increase over 1974	
	23% increase over 1973		40% increase over 1973	
1976	9,234	52.8	39,765	181.8
	1% increase over 1975		7% increase over 1975	
	24% increase over 1973		50% increase over 1973	
1977	9,961	57.7	46,479	215.0
	8% increase over 1976		17% increase over 1976	
	33% increase over 1973		75% increase over 1973	
1978	10,677	63.2	48,513	231.4
	7% increase over 1977		4% increase over 1977	
	43% increase over 1973		82% increase over 1973	
1979	10,484	62.5	51,263	243.2
	2% decrease over 1978		6% increase over 1978	
	40% increase over 1973		93% increase over 1973	
1980	11,916	69.9	62,462	288.9
	14% increase over 1979		22% increase over 1979	
	60% increase over 1973		135% increase over 1973	

Potential Gas Resources From Nonconventional Sources[1]

—Potential Gas Agency, Golden, Colorado

INTRODUCTION

A large potential natural gas resource exists in the United States within reservoirs that are not producible with the conventional drilling and production techniques employed in the past. This section, prepared by the Potential Gas Agency, is a review of the status of research and knowledge regarding the potential production of natural gas from nonconventional sources and includes published estimates of the magnitude of this potential supply. This section was first included in the Potential Gas Committee's 1979 report, and reviewed the potential natural gas supply from geopressured-geothermal zones, gaseous coal seams, tight (low permeability) formations, and brown (Devonian) shales. The present review updates the earlier one with the developments which have come to our attention during the past two years in each of these categories. In addition, the review has been expanded to include a fifth category of nonconventional natural gas resource, namely, gas hydrates.

It must be emphasized that this review is not an independent appraisal by either the Potential Gas Committee or by the Potential Gas Agency of the volume of natural gas within nonconventional sources, but only a summary of published reports made by other agencies on this subject. The estimates contained in this section must not be confused with those prepared by the Potential Gas Committee. It is important, however, to understand the relationship between the estimates of potential supply from nonconventional sources and those reported by the Committee.

The estimates of potential supply of natural gas in the United States prepared by the Potential Gas Committee include only those quantities of natural gas which meet the specific guidelines established by the Committee; that is, only natural gas considered by the Committee to be recoverable in the future under assumed conditions of adequate economic incentives in terms of price/cost relationships and current or foreseeable technology is included in those estimates. In the past, the feasibility of recovering natural gas from nonconventional sources had not been reasonably demonstrated. Consequently, natural gas from such sources has largely been excluded from the Committee's estimates. In recent years, however, interest in the potential supply of natural gas from nonconventional sources has increased as well as the availability of information about them. Improvements in drilling and production technology accompanied by a more favorable economic climate have made it possible for future recovery of significant volumes of natural gas from some of these sources. As a result of these developments, the Committee has included in its current estimates some quantities of natural gas from sources that were previously considered to be nonconventional.

Natural gas recovery from geopressured-geothermal zones of the U.S. Gulf Coast region, coal seams, and gas hydrates has not yet been adequately demonstrated, and no potential supply from these sources is included in the estimates presented by the Committee. The potential natural gas resource from the brown

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[1] This report is a revision and expansion of the report on potential gas resources from nonconventional sources prepared by Wilson H. Herrod and published in *Potential Supply of Natural Gas in the United States (as of December 31, 1978)*. The sections dealing with natural gas from geopressured aquifers, tight formations, Devonian shales and gas from coal seams were revised by James C. Donaldson, Potential Gas Agency and Department of Geology, Colorado School of Mines. The section on gas hydrates was written by James J. Emme, Department of Geology, Colorado School of Mines.

We are grateful for the contributions made by John F. Bergquist, Myron H. Dorfman, Alex Gillies, Malcolm A. Goodman, Richard D. McIver, John L. Moore, William F. Morse, Harvey S. Price, A. D. Rial, and John C. Sharer by their review of various sections of this report.

(Devonian) shales of the Appalachian, Illinois, and Michigan basins is largely excluded except for that portion which exists in areas geologically similar to regions currently producing gas from brown shales and is believed to be recoverable by conventional drilling and improved well stimulation and completion methods. Potential supply of natural gas from tight formations (including sandstone, shale, and carbonate reservoirs) is included in the Committee's estimates in areas where this resource is considered to be within the guidelines established by the Committee. In some cases, this will include gas from formations with less than one millidarcy permeability. The estimates for gas resources from tight formations prepared by other estimators and presented in this section are generally based upon evaluation of formations with less than one millidarcy permeability; consequently, these estimates may somewhat overlap those prepared by the Committee. Because of changing definitions and differences in estimation methods of gas from tight formations, there is no clear boundary between the Committee's estimates and those reported by others. The possible overlap and the uncertainty in the boundary will require further investigation.

NATURAL GAS FROM GEOPRESSURED AQUIFERS

The term *geopressure* was introduced during the 1950s by petroleum engineers to describe subsurface intervals where the pressures encountered exceeded those anticipated for a particular depth. A geopressured zone, or synonymously, an "overpressured" or "abnormally pressured" zone, is one in which fluid pressures are greater than the normal, or hydrostatic, pressure because at least part of the rock overburden load is being supported by the fluid. Under hydrostatic conditions, the fluid pressure for any subsurface point may be approximated by applying a gradient of 0.465 psi per foot of depth, which is roughly equivalent to the weight of a column of normal marine water of the same height. However, with geopressured zones the pressure gradient may be as great as 0.98 psi/foot, largely reflecting the weight of the overlying sedimentary rocks (Dorfman, 1976, p. 34). Geopressured zones have been found in various regions of the United States (fig. 20). However, since the largest and most likely commercial targets are located in the Gulf Coast region, most research and interest has been restricted to this area. Consequently, this review is confined to summarizing findings for the Gulf Coast region only.

In general, geopressured zones arise from the compaction of rapidly deposited clays and sands of low overall permeability. Such conditions are commonly associated with deltaic sedimentation such as characterizes the northern Gulf of Mexico, or Gulf Coast, basin. As shown in figure 21, Cenozoic sediments associated with major centers of deltaic deposition along the Gulf Coast attain thicknesses of 50,000 feet (15,250 m). These sediments are largely composed of sands, silts and clays deposited by delta systems ranging in age from Eocene to Holocene. The overall pattern is one of sediment-induced regression of the sea with a consequent gulfward shift of successive depositional sites. As a result of this leapfrogging of sediment wedges, large volumes of sands and clays were quickly deposited atop soft, unconsolidated muds and silts. This rapid loading resulted in clay compaction and the isolation of porous and permeable sands with impermeable shales. In addition, large, generally southward-dipping, growth faults developed which further compartmentalized these sands (fig. 22). Thus isolated, their interstitial fluids were forced to accommodate at least part of the subsequently deposited sediment load, and thereby became geopressured. The ultimate pressure which can be achieved under such conditions is directly proportional to the rate of loading and indirectly proportional to the mean transmissibility of the enclosing rocks. Within the Gulf Coast geopressured intervals, pressure gradients often approach lithostatic pressures, or 1.0 psi/foot, and actual pressures may exceed 16,000 psi at drilled depths (Jones, 1977, p. 903).

Besides abnormally high pressures, geopressured zones are also characterized by elevated geothermal temperature gradients (fig. 23). Since heat flow is primarily a function of convective groundwater movement, the hydrostatic conditions near the top of the geopressured zone act as a thermal blanket. Therefore, in going from the hydrostatic to the geopressured zone of the Gulf Coast, a sharp increase in the geothermal gradient is experienced. Temperatures within the geopressured zone generally vary from about 300° F. to 500° F. (149° C. to 260° C.), and temperatures within potential sand reservoirs range from 300° F. to 350° F. (149° C. to 177° C.) (Dorfman, 1976, p. 34). Others would extend the lower limit of the temperature range to 200° F. (93° C.) (J. C. Sharer, private communication, 1981; Jones, 1977). In a recent evaluation of two wells in Texas and Louisiana, the National Petroleum Council (1980) reports generally higher temperatures in the Texas geopressured zones. Temperatures for the Texas sediment were on the order of 300° F. (149° C.) compared to a range of 230° F. to 320° F. (108° C. to 160° C.) for the Louisiana sediment.

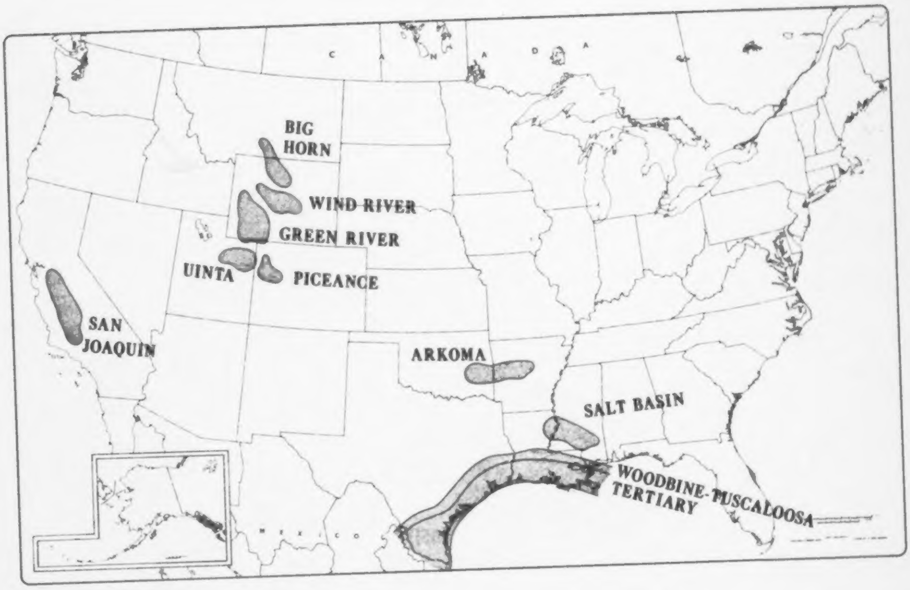
CANADA
BIG HORN
WIND RIVER
GREEN RIVER
UINTA
PICEANCE
SAN JOAQUIN
ARKOMA
SALT BASIN
WOODBINE-TUSCALOOSA
TERTIARY
MEXICO

Figure 20 — United States geopressured brine formations

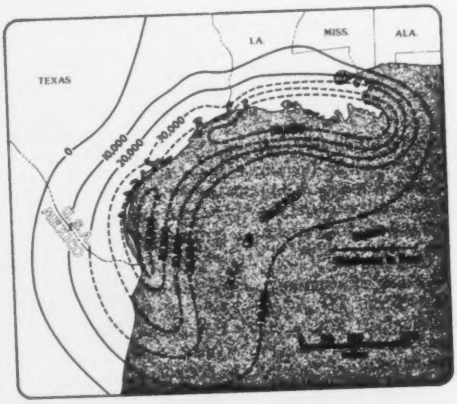
TEXAS
LA.
MISS.
ALA.
0
10,000
20,000
30,000
U.S.A.
MEXICO

Figure 21 — Thickness of Cenozoic deposits in the Gulf Coast basin (After Dorfman, 1977) Reproduced courtesy of Dr. M. H. Dorfman

Another anticipated characteristic of geopressured zones, based on early work, was reduced water salinity (fig. 24). Water salinities within the geopressured zones were originally expected to be less than 20,000 ppm in contrast to those within the overlying hydropressured intervals frequently exceeding 100,000 ppm (Dorfman, 1977, p. 880). However, recent testing of geopressured zones has shown salinities as high as 150,000 ppm and an expected range for most prospects on the order of 40,000 to 80,000 ppm (J. C. Sharer, private communication, 1981). A reduction in salinity is probably caused in part by the expulsion and hyperfiltration of bound water from adjacent shales, due to the thermal transformation of montmorillonitic clay into mixed-layer clay in the geopressured environment (Dorfman, 1976, p. 35; 1977, p. 880). This expulsion may serve to transport generated hydrocarbons from source rock to reservoir as well as to replace saline water with brackish water within sandstones.

Within the Gulf Coast basin, the top of the geopressured zone can be detected and mapped using drilling, seismic, or well log data. Figure 25 illustrates five pressure-prediction parameters for a Louisiana Gulf

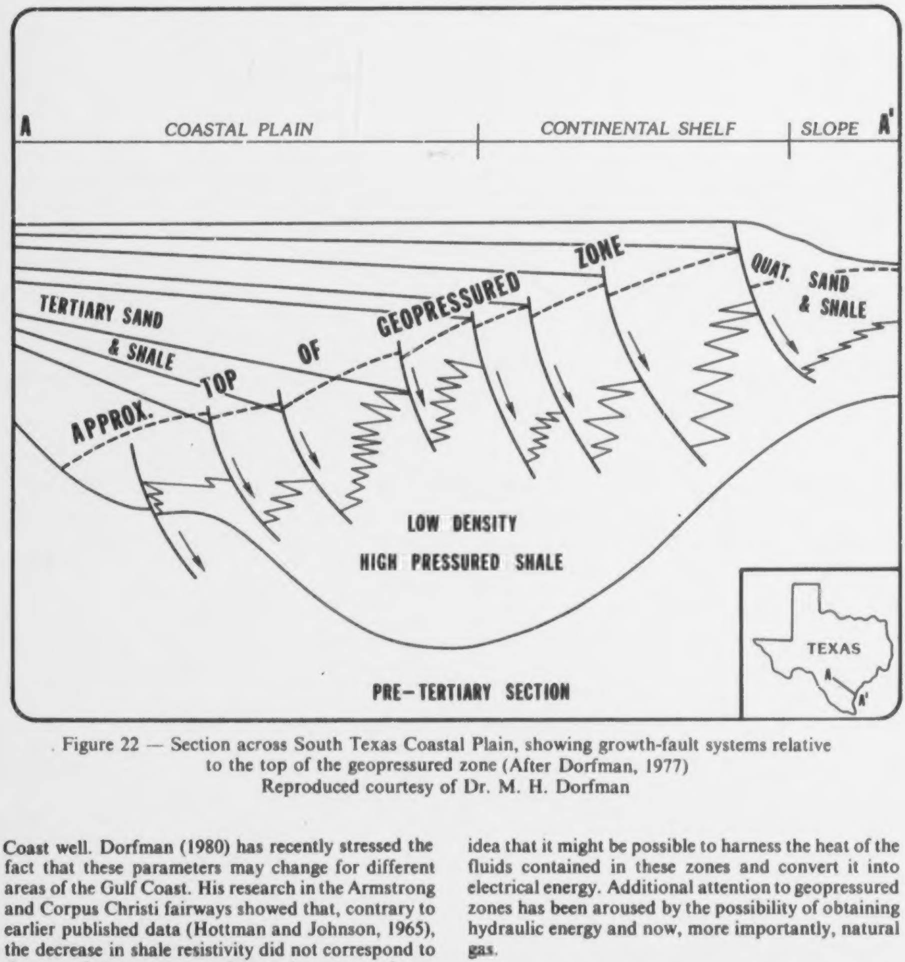

Figure 22 — Section across South Texas Coastal Plain, showing growth-fault systems relative to the top of the geopressured zone (After Dorfman, 1977)
Reproduced courtesy of Dr. M. H. Dorfman

Coast well. Dorfman (1980) has recently stressed the fact that these parameters may change for different areas of the Gulf Coast. His research in the Armstrong and Corpus Christi fairways showed that, contrary to earlier published data (Hottman and Johnson, 1965), the decrease in shale resistivity did not correspond to the top of the geopressured zone, but occurred at a pressure gradient of about 0.7 psi/foot. Jones (1977, p. 890) has noted that the depth to the top of the zone varies from less than 3,000 to about 18,000 feet (915 to 5,490 m) (fig. 26). Although the 200° F. (93° C.) isotherm is commonly near the top of the geopressured zone, no clear relationship between temperature and pressure exists. As much as 5,000 feet (1.6 km) of relief may be exhibited by the 200° F. (93° C.) isotherm within a 100-square-mile area.

Interest in geopressured aquifers increased with the idea that it might be possible to harness the heat of the fluids contained in these zones and convert it into electrical energy. Additional attention to geopressured zones has been aroused by the possibility of obtaining hydraulic energy and now, more importantly, natural gas.

Methane is contained within geopressured zones in three forms: (1) gas in solution, (2) free gas, and (3) residual gas (Sharer, 1980). Published estimates of the amount of gas in geopressured brines include only the gas in solution, and not the possible contribution of free and residual gas to production. In general, the solubility of methane in water is directly proportional to reservoir temperature and pressure, and inversely proportional to formation-water salinity. Figure 27 illustrates the relationships between methane solubility as a function of pressure for specific values of

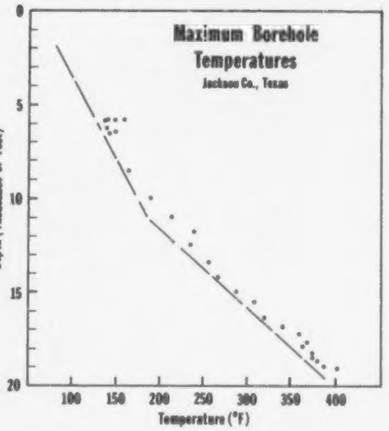

Figure 23 — Relationship between average geothermal gradient and occurrence of geopressure in the central Texas Gulf Coast (After Jones, 1977)
Reproduced courtesy of Dr. P. H. Jones

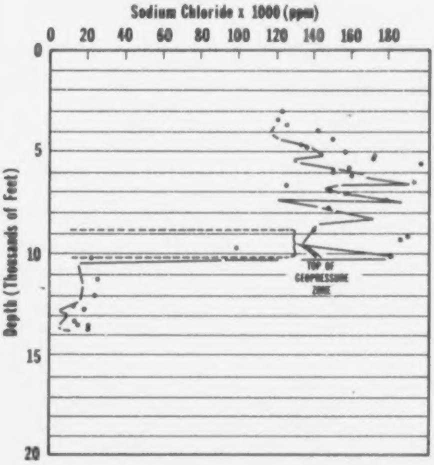

Figure 24 — Change in formation water salinity with depth relative to the top of the geopressured zone, Manchester Field, Louisiana
(After Bebout, et al., 1978)
Reproduced from the Bulletin of the American Association of Petroleum Geologists by permission

temperature and salinity (assuming full saturation). Variations in temperature, pressure and water salinity make prediction of gas saturation difficult. Typical saturation levels of geopressured brines are between 20 to 40 standard cubic feet of gas (scf) per barrel (bbl) of brine. Produced-gas-to-water ratios with values of up to 70 scf/bbl have been reported where co-production of residual gas and/or free gas was anticipated (J. C. Sharer, private communication, 1980).

The Resource

A number of estimates of the dissolved methane resource within the Gulf Coast geopressured aquifers have been made and are summarized in table 26. The most recent estimate, published in 1979 by the U.S. Geological Survey, reported a total in-place resource in both offshore and onshore areas of 5,700 Tcf (Wallace, et al., 1979). In the most conservative scenerio used in the study, the ultimately recoverable resource was estimated to be 150 Tcf. Lewin and Associates (1978) estimated a total in-place onshore resource of 860 Tcf with 42 Tcf of this considered to be recoverable. After re-evaluation of the Texas portion (Oligocene Frio Formation only), the estimate of Lewin and Associates was revised upward the following year to 1,100 Tcf and 50 Tcf for in-place gas resource and recoverable resource, respectively (cited in Kuuskraa and Meyer, 1980). This latter estimate compares well with Bernard (1978), who concluded that the recoverable resource for the Gulf Coast is 54 Tcf. Jones (1976 and 1977) is, by far, the most optimistic of all evaluators and has estimated a total resource in-place, in geopressured brines, both onshore and offshore, of 49,000 Tcf. He also speculated that a comparable volume could be present

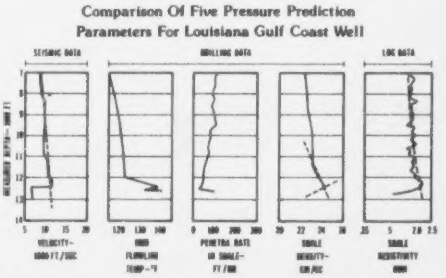

Figure 25 — Geopressure prediction parameters for a Louisiana Gulf Coast well (After Jones, 1977)
Reproduced courtesy of Dr. P. H. Jones

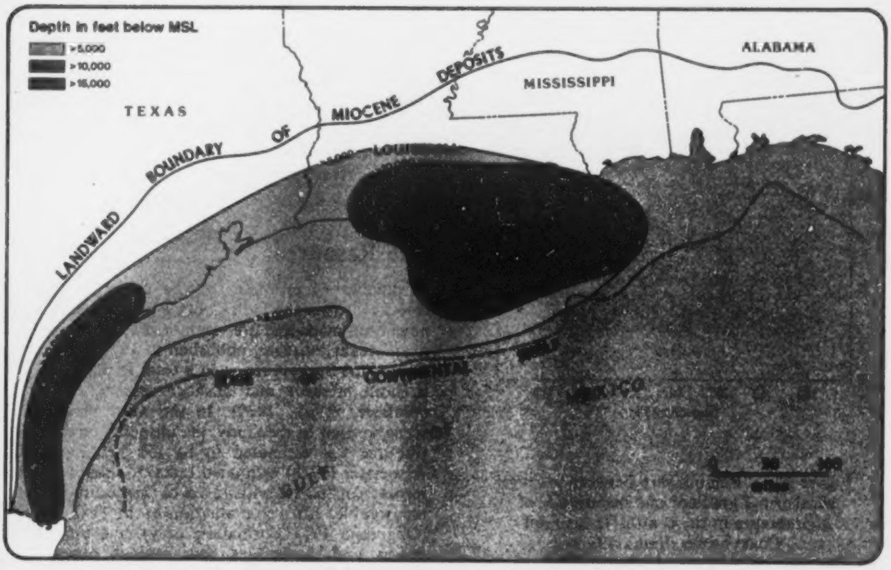
Depth in feet below MSL
>5,000
>10,000
>15,000
TEXAS
LANDWARD BOUNDARY OF MIOCENE DEPOSITS
MISSISSIPPI
ALABAMA
LOUI
CONTINENTAL
SHELF
GULF
OF MEXICO
miles

Figure 26 — Depth of occurrence of geopressured zones (After Jones, 1977)
Reproduced courtesy of Dr. P. H. Jones

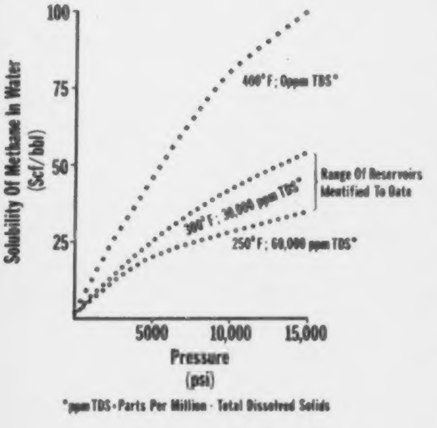

Figure 27 — Gas solubility in brine
(Kuuskraa and Meyer, 1980)

within associated geopressured shales, some of which might migrate into adjacent sands as the sands are depleted by production. Dorfman (1977) proposed an in-place resource of 5,735 Tcf for the same area and indicated that the recoverable resource is approximately 256 Tcf. This latter figure was presented as an idealized upper limit, based upon optimum geological conditions and without regard to time, rate of production, or economics. Hise (1976) estimated an inplace resource of about 3,000 Tcf, with 125 Tcf being physically recoverable, again, under optimum conditions. Papadopulos, et al. (1975) estimated 23,618 Tcf for the total gas in-place, with the ultimately recoverable resource ranging from 110 to 770 Tcf.

The wide variation in the resource estimates reflects both the many physical and economic uncertainties involved and the differing assumptions and approaches used by the various estimators. Two general areas where uncertainties arise are in the determination of: (1) the number and quality of geopressured reservoirs available, and (2) the volume of methane which may be dissolved in water under varying physical conditions.

Table 26 — Comparison of estimates of gas in geopressured aquifers (Tcf)

Source	Total Gas In-Place	Ultimately Recoverable Gas
Wallace, et al. (1979)		
Onshore	3,100	97
Offshore	2,800	53
Total	5,700	150
Lewin and Associates (1979)*	1,100	50
Lewin and Associates (1978)	860	42
Bernard (1978)	—	54
Dorfman (1977)	5,735	256
Jones (1976 and 1977)	49,000**	260-1,200***
Hise (1976)	3,000	125
Papadopulos, et al. (1975)	23,618	110-770***

*1979 revision cited in Kuuskraa and Meyer, 1980.

**Jones speculated that another 45,000 Tcf may be present within associated geopressured shales, some of which might migrate into adjacent sands as they are produced.

***Cited in Sharer, 1980.

While the various estimators agree on the general area underlain by potential geopressured aquifers (which runs from the Rio Grande River to the Florida Panhandle, and from the landward limit of Eocene growth faulting, about 100 miles inland, southward to the edge of the continental shelf), they are not unanimous as to the number of square miles encompassed by this area. The Wallace, et al. (1979) study for the U.S.G.S. included 119,692 square miles (310,000 km^2), more than double the 55,985 square miles (145,000 km^2) used in the earlier Papadopulos, et al. (1975) study. Lewin and Associates (1978) used the same area reported in the U.S.G.S. 1975 evaluation. Jones (1976, p. 19) cites a figure of 150,000 square miles (388,500 km^2) while Dorfman (1977, p. 881) prefers 100,260 square miles (259,673 km^2), and Hise (1976, p. 57) uses an even 100,000 square miles (259,000 km^2).

For purposes of methane resource evaluation, both Jones (1976 and 1977) and Dorfman (1977) agree on a geopressure basement of 25,000 feet (7,625 m). Sediments below this depth consist largely of silts and shales with minimal reservoir potential. Furthermore, 25,000 feet appears to be a reasonable economic and technological limit for drilling. However, these two authors arrive at different conclusions relative to the total volume of geopressured sandstone within this interval and regarding the reservoir characteristics.

In contrast to the work of Jones and Dorfman, the Papadopulos, et al. (1975) study for the U.S.G.S. used a maximum depth of 19,685 feet (6 km) in Texas and 22,966 feet (7 km) in Louisiana. In the later U.S.G.S. study (Wallace, et al., 1979), they used a uniform depth of 22,500 feet (6.86 km). Lewin and Associates (1978) evaluated only the interval between 10,500 and 19,000 feet (3,209 m and 5,791 m, respectively).

While both Dorfman (1977, p. 881) and Hise (1976, p. 57) use 10,000 feet (3,050 m) for the average thickness of geopressured sediments throughout the basin, Dorfman considers 15 percent of this section to be actual reservoir sandstone with an average porosity of 22 percent, and Hise estimates that only 10 percent is composed of sandstone, with a slightly lower porosity of 20 percent. Rather than using an average reservoir thickness for the entire basin, Jones (1976 and 1977) bases his calculations on estimated cumulative reservoir sand (derived from regional facies studies and selected dip sections) within a representative subarea which is then extrapolated, with some adjustments, to the entire region.

General observations indicate that there are tendencies, perhaps inherent in any extrapolation, for estimators to assume more reservoir uniformity and continuity than may actually exist. It is known that the principal geopressured reservoirs along the Gulf Coast are long, linear, often discontinuous, aquifers arranged in fairways which are parallel to the coast. Of five such fairways delineated with the Oligocene Frio Formation along the Texas coast, all save one exhibited either inadequate permeability or limited vertical or lateral reservoir development (Bebout, et al., 1978).

Variations in the estimates are also a reflection of differences in assumed values for methane solubility. The U.S.G.S. studies, Papadopulos, et al. (1975) and Wallace, et al. (1979), evaluated separate intervals and calculated methane content using temperature, pressure and salinity data from each one. Lewin and Associates used the same approach and obtained a methane content of 16 scf per barrel of brine at depths between 10,500 and 11,000 feet (3,200 m and 3,352 m) which increased to 47 scf per barrel for the interval 18,000 to 19,000 feet (5,486 m to 5,791 m). Dorfman (1977, p. 881) uses a value of 35 scf per barrel for calculating total resource in-place, and applies an average of 25 scf per barrel in determining recoverable volumes. Jones (1976 and 1977), on the other hand, uses a value which increases with depth from 18.8 scf per barrel at 8,000 feet (2,440 m) to 164 cu. ft. at 25,000 feet (7,625 m).

National Petroleum Council Study

A task force appointed by the National Petroleum Council (1980) recently evaluated the resource potential of geopressured aquifers. This study considered eleven prospective areas in Texas and Louisiana which had previously been selected as potential drill sites for geothermal energy and not for natural gas. From evaluation of these areas, projections were made for the development of undesignated areas which were modeled after one of the areas studied in detail. The amount of gas which could be recoverable by the year 2000 in the opinion of the task force was estimated for the eleven prospective areas and the projected, but undesignated, areas. This study assumed gas prices ranging from $4.00 to $9.00 per Mcf and a 10 percent (real) rate of return on investment. The different scenarios investigated by the task force involved different projections for the number of wells drilled and production rates. The most optimistic case resulted in a projected recovery of 568 Bcf from 96 wells by the year 2000, while the less optimistic case projected a recovery of 240 Bcf from 43 wells, also by the year 2000.

In evaluating the results of the NPC study, it is important to note that this study was restricted to a limited number of prospects originally selected for their geothermal potential and projection of these areas into a limited number of undesignated areas. The projections included an assumed rate of development to the year 2000. Additionally, the reservoir study was based upon models used for petroleum reservoirs which may not be applicable to aquifers with different major drives, including compaction of sediments and influx of water from adjacent shales (M. H. Dorfman and H. B. Harkins, private communication, 1981).

Current Research and Development

From the above discussion, it is clear that a considerable, though unknown, volume of natural gas might be recovered from the geopressured-geothermal aquifers of the Gulf Coast. The critical question then becomes, can this resource be produced economically? Recent research and development has largely been directed toward resolving this overriding uncertainty. To do so, additional data must be acquired in order to more thoroughly understand the following uncertainties:

— reservoir extent and continuity

— reservoir quality (porosity, permeability, thickness)

— gas recovery efficiency

— nature and saturation of the gas

— production problems (sand production, corrosion and scaling)

In 1975 the Petroleum Engineering Department of Louisiana State University, under contract to the Energy Research and Development Administration (ERDA, now part of the Department of Energy), began investigating the geothermal-geopressured resource of southern Louisiana for the purpose of locating promising prospects. More recently, the University of Texas at Austin completed a detailed geological and engineering analysis of the Oligocene Frio Formation of the Texas Gulf Coast, also with the purpose of delineating geothermal-geopressured drilling prospects (Bebout, et al., 1978). Prospective areas were expected to meet the minimum requirements of a reservoir volume of 3 cubic miles with a permeability of at least 20 millidarcys and a fluid temperature of 300° F. (149° C.), or greater. The 300° F. (149° C.) specification was designed to accent geothermal, as opposed to natural gas, resources. When methane dissolved in the geopressured waters became recognized as a potential major energy resource, reservoir requirements changed. An ideal prospective reservoir became one with (1) a minimum gas saturation of 30 scf/bbl of brine, (2) an initial bottom-hole pressure exceeding 12,000 psi, (3) a volume of at least one cubic mile, and (4) a thick and very permeable sand (Kuuskraa and Meyer, 1980).

The U.S. Department of Energy (initially under ERDA, later DOE) began a large program in 1977 to assess the energy potential of the geopressured zones. Under this program, four wells have been completed and tested. The results of these tests have shown that the amount of gas in solution was much lower than anticipated (ranging from 20 to 25 scf/bbl). Low gas content was attributed to high concentrations of dissolved solids (100,000 to 200,000 ppm) (Kuuskraa and Meyer, 1980). One of these wells, the Edna Delcambre No. 1 well located in southern coastal Louisiana, produced methane at a rate of 70 cu. ft. per barrel of water, or roughly three times the amount of gas believed to be dissolved in the brine. These findings indicate the presence of free gas in the reservoir and are interpreted by Rosenberg and Sharer (1980) to indicate that free gas occupied up to 6.5 percent of the reservoir pore space. The validity of this idea depends on whether sufficient gas is available within a given reservoir to both saturate the reservoir water and to partially fill available pore space as a separate phase. Continuation of the DOE test program may resolve the validity of this hypothesis which, if correct, will result in a geopressured natural gas resource that is much larger than current projections. At the present time, however, the anomolously high methane concentration observed in the brines produced from the Edna Delcambre No. 1 well is the exception to the rule and the free gas hypothesis remains speculative at best.

Obstacles to Commercialization

Perhaps the greatest obstacle to full commercialization of geopressured gas resides in our ignorance of the true nature and extent of the resource. Undoubtedly, the DOE evaluation program will alleviate some of this uncertainty. However, other technological, legal, economic and environmental problems exist.

Technological

While the technology to produce hot, geopressured brines exists, it has never been tested, certainly not at the high flow rates (in excess of 50,000 barrels of water a day) anticipated by many authors as economically necessary for an adequate rate of return on investment. The high flow rates combined with the poorly consolidated nature of some aquifer sandstones may generate problems with sand control. Production problems may also arise because of permeability reduction due to declining aquifer pressures (Lewin and Associates, 1978). DOE tests at the Fairfax Foster Sutter No. 2 well in Louisiana and the Pleasant Bayou No. 2 well at Austin Bayou in Texas have shown that dissolved carbon dioxide reduced the pH levels of the geopressured brines to 6 or below. Such acidity may cause serious down-hole corrosion which, with the high production rates, would be difficult to treat or prevent (National Petroleum Council, 1980).

Legal

Legal problems relate both to ownership and operating practices. Since the potential resource spans several states, each will have to establish guidelines, hopefully similar, for ownership of solution gas relative to previously established oil and gas leases. In addition, distinction between geopressured solution gas rights and water rights will be required. Due to the large reservoirs required to sustain the high productivity rates demanded by economics, a great number of land and royalty owners are likely to be involved in any one prospect.

Economic

Uncertainty exists regarding the economic viability of geopressured solution gas production. The economics are complicated by a fundamental lack of knowledge about the resource. It is not known whether or not sustained brine production rates are possible, and if so, for what length of time and at what flow rate. The problem is also compounded by the inability to predict methane content of the brines. In an attempt to quantify the uncertainties, scenarios have been developed to show the minimum production rates and methane content required to recover investment costs for assumed gas price levels (Lewin and Associates, 1978). In addition, estimates for ultimately recoverable gas have been calculated for assuming different production rates, methane content and gas-price levels (National Petroleum Council, 1980). Lewin and Associates (1978) estimated that at gas prices of $1.75, $3.00 and $4.50 per Mcf (1977 dollars) the amount of economically recoverable gas is reduced from the maximum 42 Tcf recoverable to about none, 1.1 Tcf and 5.4 Tcf, respectively. When one includes additional benefits from the produced fluids such as power generation, heating, or industrial applications, the economics may improve on a site-specific basis. At the same time, however, these additional uses impose limitations relative to minimum permissible reservoir temperature and pressure, and may limit the recovery of the resource base. The uncertainty related to the cost of disposal of produced brines further clouds the economic picture. However, if co-production of mobile and/or immobile gas in conjunction with solution gas is plausible, economic recovery of methane could be attractive in the near future (Geer and Sharer, 1980).

Environmental

Several environmental problems are posed by producing huge volumes of geopressured-geothermal waters.

First, there is the problem of what to do with the water once the gaseous, mechanical and thermal energy has been depleted. Since salinity of the water precludes surface discharge (at least onshore), most plans call for reinjection into shallower sands. Second, there is the potential of subsidence. Hise (1976, p. 60) estimates a maximum subsidence of 1.0 m might occur directly above the center of a producing aquifer. However, Jones (1976, p. 69) has observed that since one-half to two-thirds of the resource occurs offshore, subsidence might not be as great a problem. Finally, there is the possibility that depressuring of deep reservoirs, which are often associated with growth-fault development, while at the same time pressuring shallower reservoirs by fluid injection could trigger recurrent movement along faults.

Conclusions

Geopressured aquifers in the Gulf Coast contain a large natural gas resource estimated to be between 1,100 (Lewin and Associates, revised estimate, 1979, cited in Kuuskraa and Meyer, 1980) and 49,000 Tcf (Jones, 1976, 1977) in-place. The estimated recoverable resource is between 50 (Lewin and Associates, revised estimate, 1979, cited in Kuuskraa and Meyer, 1980) and 1,200 Tcf (Jones, 1976 and 1977, cited in Sharer, 1980). Adequate technology for drilling geopressured reservoirs presently exists, but the technological, legal, economic and environmental uncertainties involved in recovery of this potential resource currently deter development efforts. Most authors doubt significant production prior to 1985 (Dorfman, 1977, p. 885), and the National Petroleum Council report (1980) concludes that "large-scale production is highly unlikely prior to the year 2000".

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GASEOUS COAL SEAMS

The occurrence of methane in coal has been the subject of investigation since the early part of this century. The purpose of past investigations was largely to improve mine safety by averting the accumulation and explosion of indigenous methane. Recently, the accepted practice has been to dilute the methane with air as it is piped to the surface from mine workings. Kuuskraa and Meyer (1980) estimate that approximately 217 MMcf per day, or 80 Bcf per year is lost to the atmosphere in this manner.

Methane is a by-product formed during the conversion of organic material to coal, a process referred to as coalification. Though much of this gas is lost to the atmosphere, a substantial portion is retained as (1) gas absorbed on the surface of the microporous structure of the coal, (2) free gas in vertical joints and fractures (cleats) in the coalbed, and as (3) desorbed gas trapped within adjacent sediments. Categories (1) and (2) represent a nonconventional gas resource which is directly determined by the nature of the producing interval, namely the coal seam. Category (3) represents a resource which is difficult to classify as a conventional or nonconventional resource. In situations where adjacent sediments are porous and permeable, trapped gas derived from coal seams can be produced by conventional drilling and completion procedures.

Because of the natural association of methane with coalbeds, the geological dimensions of the gas resource are defined by the extent of the subsurface coalbeds (fig. 28). The amount of gas to be found within a given coal unit is a function of, among other things, the rank of the coal and the depth of burial (fig. 29). The rank of coal is important since methane content is inversely proportional to the moisture of the coal. Moisture content decreases with an increase in coal rank resulting in a corresponding increase in methane content. The rank of a coal depends upon its degree of coalification which is a function of time, temperature and pressure. These factors are, in turn, determined by the tectonic and burial history of the organic material present. Depth of burial is important because it determines the pressure of the coal seam, and gas content increases with an increase in pressure.

The Resource

Estimates of total in-place gas resource vary between different studies and even show a wide range within studies (table 27). Variations are due, in part, to the limited data available for gas content of all coals and wide ranges in the estimates of the coal resource. In addition, researchers have made different assumptions and have used different approaches and methods in making their estimates.

The National Gas Survey Task Force on Nonconventional Natural Gas Resources has estimated that between 300 and 850 Tcf of methane may be present within the coalbeds of the United States (Federal Energy Regulatory Commission, 1978). This estimate is based on what is considered to be a conservative average of 200 cu. ft. of natural gas per ton of coal. Of the total of 850 Tcf, 300 Tcf is estimated to be associated with coal classified as "remaining identified resources," that is, with less than 3,000 ft. of overburden (excluding strippable zones). The remaining 550 Tcf is gas postulated to be associated with coals classified as "estimated hypothetical resources," that is, in unmapped and unexplored areas, and as "estimated additional hypothetical resources in deeper structural basins" (i.e., between 3,000 and 6,000 feet, or 915 to 1,830 meters in depth).

Deul and Kim (1978) estimate a total in-place resource of 766 Tcf of which 318 Tcf represents identified resources with the hypothetical resource being 448 Tcf.

The most recent estimates for total in-place gas resource are by the National Petroleum Council (1980) and Kuuskraa and Meyer (1980). Both of these studies used a similar approach which involved estimating the amount of coal resource by rank. Instead of assuming an average gas content per ton of coal, they used a different value for each rank of coal (based on moisture content). Kuuskraa and Meyer included one additional consideration and allowed for the effect of burial depth on gas content by using different yields for each rank for different depths (table 28). Even though the estimates for the total gas resource do show a large variation, they indicate a very large potential energy source to be obtained from gaseous coal seams. It must be mentioned, however, that estimates for the potential in-place resource do not account for the possibility that some portion of the initially-generated gas may have migrated to the ground surface, possibly through fissures in the coal deposit, and, consequently, have been lost to the atmosphere. If this has happened, the in-place resource would be less than the estimates indicate.

More important than the absolute value of in-place gas resource is the amount considered to be recoverable. Total gas in-place estimates are based on estimates of the total coal resource. Much of the coal resource, however, is found in beds considered to be too thin or of insufficient rank and depth to have gas production potential without major advances in production technology. Kuuskraa and Meyer estimate 550 Tcf for the total in-place gas resource, but by considering only

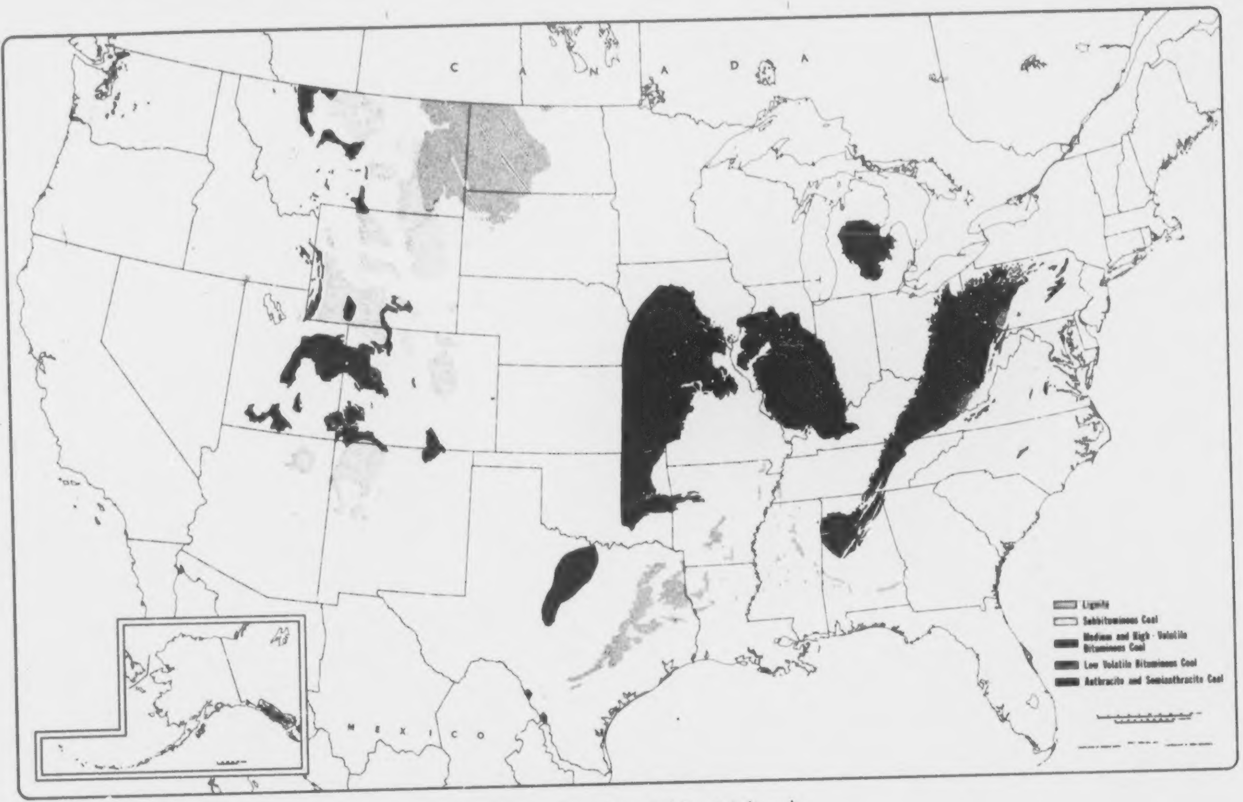
C A N A D A
M E X I C O
Lignite
Subbituminous Coal
Medium and High - Volatile Bituminous Coal
Low Volatile Bituminous Coal
Anthracite and Semianthracite Coal

Figure 28 — Location of U.S. coal deposits
(After Deul and Kim, 1975)
Reproduced from The Oil and Gas Journal by permission

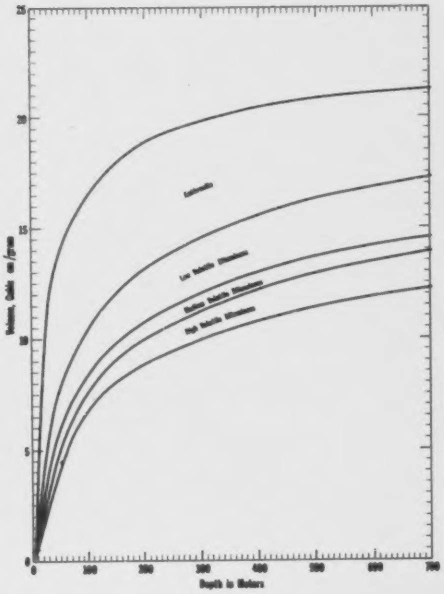

Figure 29 — Estimated methane content of coal with depth and rank (Kim, 1977)

the coal resource with sufficient rank and depths and found in thick beds, they reduce this figure to 135 Tcf. One hundred thirty-five (135) Tcf is the favorable resource or what can reasonably be assumed to be a viable target for future production efforts. They estimate a 30-45% recovery efficiency which gives the amount of methane technically recoverable from coal seams to be in the range of 40-60 Tcf. In a 1979 review, Gas Research Institute summarized the estimates made by others of the recoverable resource as ranging from 16 to 487 Tcf (Rosenberg and Sharer, 1979). In a later paper based on their collection and interpretation of judgmental estimates of experts in the field, Gas Research Institute gave estimates of the amount of gas thought to be recoverable, at selected market prices of $3.00 to $6.00/Mcf (1979 dollars), of 10 to 30 Tcf for existing technology and 30 to 60 Tcf for advanced technology (Sharer, 1980).

Gas produced from coal seams is not pure methane, but its chemical composition is generally such that it is readily marketable. Methane content is comparable to that found in natural gas (90-99% for samples included in table 29 compared to an average of approximately 94% for natural gas). The quantity of other gaseous hydrocarbons is always less than 2% by volume and includes occasional ethane, propane, butane and pentane. Impurities may include large amounts of inert compounds like CO_2, N_2 and He with the possibility of small amounts of O_2 and H_2. No H_2S or SO_2 have been detected in coalbed gas.

Table 27 — Comparison of estimated total U.S. in-place gas

Study	Total Resource In-Place (Tcf)	Recoverable Resource (Tcf)
Kuuskraa and Meyer (1980)	550	40-60
National Petroleum Council (1980)	398	45*
Sharer (GRI) (1980)	500	10-60
Rosenberg and Sharer (GRI) (1979)	72-860	16-487
National Gas Survey Task Force on Nonconventional Natural Gas Resources Federal Energy Regulatory Commission (1978)	300-850	(not reported)
Deul and Kim (1978)	318-766	(not reported)

*Assumes a price of up to $9/Mcf and rate of return of 10% (1979 dollars).

Table 28 — Gas content of U.S. coals by rank and depth (Kuuskraa and Meyer, 1980)

Rank	Depth (ft)		
	Under 1,000	1,000-3,000	Over 3,000
	cf/t	cf/t	cf/t
Anthracite and Bituminous	150	250	500
Sub-Bituminous	60	100	200
Lignite	30	50	100

The thermal quality of coalbed gas is very similar to that of high-methane-content natural gas. The coal-gas samples included in table 29 range from 973 to 1,059 Btus per cu. ft., while natural gas with more complex gaseous hydrocarbons has a slightly higher heat content averaging 1,068 Btus per cu. ft. For comparative purposes, a ton of coal containing 200 cu. ft. of natural gas with an average thermal value of 1,000 Btus per cu. ft. would contain 200,000 Btus of natural-gas thermal energy. The coal itself, exclusive of natural gas, may contain around 25,000,000 Btus of thermal energy (Tilton, 1976, p. 225). Coalbed gas is occasionally below pipeline quality in cases where heat content is below 950 Btus per cu. ft. or a high CO_2 content exists. High concentrations of CO_2 (seen in the Pittsburgh coal gas, table 29) are a potential problem to transport systems because of the corrosive nature of CO_2 when associated with water (National Petroleum Council, 1980). This difficulty can be corrected by reduction of CO_2 to a more dilute concentration before transport and utilization.

Current Research and Development

The U.S. Bureau of Mines has maintained a continuous research and development program in coalbed degasification since 1964. The historical objective of this and previous programs was to control, rather than recover, methane emissions and thereby improve mine productivity and safety. In recent years, however, an additional objective has been to demonstrate the feasibility of recovering commercial quantities of methane from virgin coalbeds as well as "gob" areas (previously mined panels or areas).

Additional research and development is being conducted by the U.S. Department of Energy (DOE) in cooperation with private industry under the auspices of the Methane Recovery from Coalbeds Project (MRCP). This project was organized in 1977 by DOE with the objective of trying to encourage the recovery and utilization of coalbed methane. To meet this end, research has been, and is continuing to be, conducted in the areas of resource estimation, location and characterization, and development of economic recovery systems and methods.

Table 29 — Composition of coalbed gas* compared with natural gas† (shown in percent)

	Pocahontas #3	Pittsburgh	Kittanning	Lower Hartshorne	Mary Lee	Natural Gas
CH_4	96.37	90.75	97.32	99.22	96.05	94.40
C_2H_6	1.39	0.29	0.01	0.01	0.01	3.80
C_3H_8	0.0147	—	—	—	—	0.6
C_4H_{10}	0.0008	—	—	—	—	0.3
C_5H_{12}	—	—	—	—	—	0.2
O_2	0.17	0.20	0.24	0.10	0.15	—
N_2	1.7	0.59	2.3	0.6	3.5	0.4
CO_2	0.36	8.25	0.14	0.06	0.10	—
H_2	0.01	—	—	—	—	—
He	0.03	—	—	—	0.27	—
Btu/SCF§	1,059	973	1,039	1,058	1,024	1,068

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*Deul, M., and Kim, A.G., "Methane in Coal: From Liability to Asset," Mining Congress Journal.

†Moore, B. J., et al., "Analyses of Natural Gas of the United States," USBM IC 8302, 1966.

§British thermal unit per standard cubic foot at atmospheric pressure. Note: 252 kilogram calories per Btu and 0.0283 cubic meters per cubic foot.

Much of the research effort has been directed toward developing improved drilling, stimulation and recovery techniques. There are three basic recovery approaches under study: vertical drilling; horizontal drilling; and slant-hole, or directional, drilling. Regardless of the technique applied, premining drainage is, of course, the ideal. Drilling activity should commence some 3 to 5 years prior to mining, as a minimum, and, ideally, the time should be extended to a 10- to 15-year lead.

Vertical drilling utilizes conventional technology to drill vertical holes into either virgin seams or gob areas. Virgin areas generally require hydraulic fracturing to stimulate production. The fracturing which is required for the stimulation of the great majority of vertical holes has caused concern among mine operators who fear damage to roof rocks and the creation of hazardous conditions in advance of mining. Such concern is particularly warranted when the strata forming the roof rock are comprised of thin layers of coal and weak shale. Early tests by BOM indicated that fracturing was confined to existing zones of weakness within the coalbed itself and did not extend into overlying or underlying units (Tilton, 1976, p. 214 and 219; Deul and Kim, 1978, p. 41). More recent research studies have reported that the roof and floor strata were affected by the hydraulic stimulation (Lambert and Trevits, 1978; Mazza, 1979), but resulted in only minor mining problems. Hydraulic fracturing has been proven to be beneficial in achieving increased gas production and is especially useful in unmineable coalbeds where its effect on roof strata is not a consideration. Because it may prove useful in mineable coalbeds, proper treatment prior to mining may be required to insure mine safety. Under certain roof-rock geologic conditions such as thin, alternating coalbeds and shales, hydraulic fracturing may be undesirable.

Horizontal drilling involves the drilling of horizontal drainage holes into the seam from existing shafts, large diameter vertical boreholes, or from working faces. Such holes intersect the vertical cleats perpendicularly and allow for maximum drainage. The initial drainage shafts, if judiciously planned and sited, could be utilized in subsequent mining operations for access and/or ventilation. A major drawback of this technique is the high cost incurred in sinking shafts. In some cases horizontal drilling has proved to be economically comparable to the drilling of vertical wells. Since horizontal drilling does not affect mining safety like the hydraulic stimulation associated with vertical drainage holes, it might be preferred, especially in cases where its utilization has proved to be economically comparable with vertical wells.

Slant-hole drilling is similar to the techniques involved in directional drilling from offshore platforms. Holes are drilled from the surface and then angled to intersect the coalbed and run horizontally through it. Although the target is generally rather thin and the most efficient drainage requires that the hole remain within the bed for a considerable lateral distance, slant-hole drilling can provide the recovery achieved with horizontal drilling. Problems associated with this technique include inadequate technology in such areas as bit control, downhole surveying, and dewatering techniques, along with the high cost of drilling. Development of the slant-hole drilling technique depends on solutions to these types of problems.

Benefits of coalbed degasification include the high quality of the product and the relatively low exploration cost. In addition, research shows that methane drainage will result in an increase in annual coal production of approximately six percent by minimizing or even eliminating methane-caused operating delays (Gabello, et al., 1980). According to Gabello, et al. (1980) this increase alone would offset the costs of the methane drainage system for the range of methane production rates that they analyzed (500-1,500 Mcf per day).

Obstacles to Commercialization

Despite the probable magnitude of the potential resource, there are technological, legal, environmental and economic obstacles to commercialization of coalbed gas.

Technological

Deul (1976, p. 198) considers the main impediment to coal degasification, in the long term, to be low coalbed permeabilities. Early work in the Pittsburgh coalbed has shown that unit to be an anisotropic reservoir with highly directional permeability (U.S. Bureau of Mines, 1974; Diamond, et al., 1975). This permeability generally parallels the vertical cleats which are best developed within coals between 800 and 1,200 feet (244 to 366 m) in depth (Deul, 1976). Such reservoirs would be most efficiently drained by horizontal drill holes which intersect the vertical cleats perpendicularly (Deul, 1976). H. S. Price (private communication, 1981) believes these characteristics to be anomalous to the Pittsburgh coalbed and that coalbeds are generally more isotropic in nature.

There is a definite need for methods of both continuous downhole surveying and accurate drill-bit guidance. This would permit extended, accurate, slant-hole drilling for most effective coalbed drainage without the need for fracture stimulation in most cases. An additional, logistical, problem may arise from the need to collect, and possibly treat, gas from a large number of holes.

In the deep "unmined" coals, development of well completion and stimulation technology is necessary before routine production of natural gas from coal seams can be accomplished. Problems have arisen from the casing cement causing damage to the coal seam. This problem is of particular concern in the case of multiple well completions. Proppants used in stimulation technology have also created a problem by flowing back into dewatering pumps and interrupting dewatering. Stimulation treatment in the form of hydraulic fracturing has not been successful below 2,000 feet due to apparent healing of the fractures and the plugging of casing perforations by "fines" flowing back (Gillies and Snygg, 1980).

Legal

A number of formidable issues must be resolved prior to commercialization of coalbed gas. The most important issue is the question of gas ownership. Until the courts make a final decision upon this issue, legal recovery and marketing of coalbed gas can only be carried out by a company owning both coal and oil and gas rights or specified coalbed-methane rights in an area, or when a compromise to produce the gas between two or more parties can be reached if separate ownership of mineral rights is involved. Generally, leaseholder rights are protected by law so that one leaseholder will not be injured by another leaseholder exercising his rights. In other words, coalbeds may not be tapped for gas by a petroleum company if mining safety regulations require coal pillars to be left as a barrier surrounding a well penetrating the coalbed. Likewise, the holder of a coal lease cannot prevent gas removal unless such production is inimical to coal production. Oil and gas leases give one the right to drill and produce hydrocarbons from any formation while ownership of the reservoir remains with the landowner. When long, horizontal holes are used for gas recovery, the project area may involve a number of landowners and the gas ownership problem is complicated further.

An additional problem related to the issue of mineral rights is the question of proprietary information. Conflicts may arise between the rights of confidentiality belonging to the coal operator and the objectives of the gas developer as regards resource appraisal. A final question is whether coalbed gas falls within the jurisdictional responsibilities of the Federal Energy Regulatory Commission.

Economic

Gas has been successfully produced by all the techniques described above. According to Kuuskraa and Meyer (1980), however, none of the methods has proven to be economically viable as an independent project. Additionally, Kuuskraa and Meyer believe gas production from coal seams by any of the three methods is currently justified economically only by considering the benefits obtained from faster, more efficient and safer mining which result from the gas production. C. T. Rightmire of TRW Energy Systems Group questions this conclusion based on the fact that there is currently some production of gas from coal seams (private communication, 1981). J. F. Bergquist of Southern California Gas Company also questions the conclusion expressed by Kuuskraa and Meyer regarding the relationship of the current economic viability of this resource to the benefits in mining because there has never been any complete verification of the economics of production of gas from coal seams. A verification of the economics would have to consider the level of in-place gas recovery which would be necessary to avoid the cost of mine ventilation facilities and the number and spacing of wellbores which would be required to achieve this goal (J. F. Bergquist, private communication, 1981).

The problem of economic feasibility is complicated by additional factors associated with degasification. Of prime importance is the uncertainty of gas deliverability rates which vary from a few Mcf per day to greater than 1,000 Mcf per day (Tilton, 1976). A coal operator generally wants to vent the gas as quickly as possible and cannot be restricted by the deliverability criteria of the utility company. In addition, the commercial specifications for a moisture content of less than 7 pounds of water per MMcf cannot be met by untreated coalbed gas, much of which contains as much as 400 pounds of water per MMcf (Harbaugh, et al., 1977). Finally, since, in some cases, coalbed gas is under less than hydrostatic pressure, compression as well as dewatering treatment may be required prior to introduction into distribution systems. In an effort to stimulate production of natural gas from coal seams, the Natural Gas Policy Act of 1978 deregulated "occluded natural gas produced from coal seams" which was classified as a "high-cost natural gas".

Environmental

The disposal of coalbed water is the main environmental problem associated with production of coalbed gas. Coalbed water varies dramatically in quality, ranging from potable to highly saline, and has a wide range of pH values. Production costs would increase in areas where dewatering is necessary and where water treatment is required prior to disposal. Though this water may serve to be an asset in dry regions, its production may draw down the water table enough to affect adversely surrounding wells used for such purposes as domestic or irrigation supplies.

Conclusions

In conclusion, it can be seen that a sizable potential resource of natural gas associated with coalbeds exists. Though estimates of gas in-place exhibit a wide range (72-860 Tcf), it appears most likely that between 40 and 60 Tcf of this resource can be recovered although the ultimately recoverable resource could be much larger. Though considerable research has been, and is being, conducted by both BOM and DOE, a number of technological, legal, environmental and economic problems persist. These obstacles, however, are not insurmountable. Commercial production of natural gas from coal seams appears to be possible within the next two decades and can contribute toward helping meet the energy needs of the United States. The National Petroleum Council (1980) calculates a potential annual production rate of 2.4 Tcf for the year 2,000 (assuming gas price of up to $9/MMBtu and a ten percent rate of return).

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NATURAL GAS FROM TIGHT (LOW-PERMEABILITY) FORMATIONS

Potential sandstone and siltstone gas reservoirs with permeability of less than 1 millidarcy exist both on- and offshore throughout the United States. These rock reservoirs may be geologically categorized into two broad groups. First, the dominantly nonmarine to transitional (deltaic) sands characteristic of the western intermontane basins which occur at depths ranging from 4,000 feet (1,220 m) to 20,000 feet (6,100 m) and usually contain natural gas generated via normal petroleum processes (Federal Energy Regulatory Commission, 1978). Second, the much shallower, depths generally less than 4,000 feet (1,220 m), marine-shelf sands of the northern Great Plains which contain biogenic gas (Rice, 1978, p. 44).

The major reservoirs are generally of Cretaceous to Tertiary age with additional scattered occurrences of diverse lithology ranging in age from Jurassic to Tertiary with some of Mississippian and Pennsylvanian age. Potential tight reservoirs occur in blanket- and lenticular-type formations. Blanket sands are single, relatively thin (10 to 100 feet), gas-bearing zones of generally uniform thickness that extend over a large area. Lenticular formations are composed of relatively thick sections (possibly 1,770 or more feet) containing laterally discontinuous beds scattered throughout the section. The National Petroleum Council (1980) estimates that more than 40 percent of recoverable tight-gas is contained in lenticular formations with the remaining recoverable tight-gas coming from blanket sands. Additional characteristics include low porosities of 5 to 15 percent and irreducible water saturations of 50 to 70 percent (Elkins, 1976, p. 127; Meyer, 1977, p. 645).

Considerable volumes of gas have long been known to exist within these tight formations. Low permeabilities and the discontinuous nature of many reservoirs make production technically difficult and expensive. The low flow rates obtained from tight-gas reservoirs have historically made exploration for and production from them economically unattractive. Economic incentive was increased by the Natural Gas Policy Act of 1978 (NGPA) which provided for a maximum price for gas from tight formations equal to 150 percent of the new onshore gas price. The maximum incentive price was subsequently raised in August of 1980 by the Federal Energy Regulatory Commission (FERC) to 200 percent of the rate allowed by the NGPA for new onshore gas. The FERC established a set of guidelines defining what constituted a "tight formation". Gas produced from formations that meet these criteria can qualify for the incentive price. Final guidelines effective September 22, 1980 are basically:

—Drilling of the well had to begin on or after July 16, 1979.

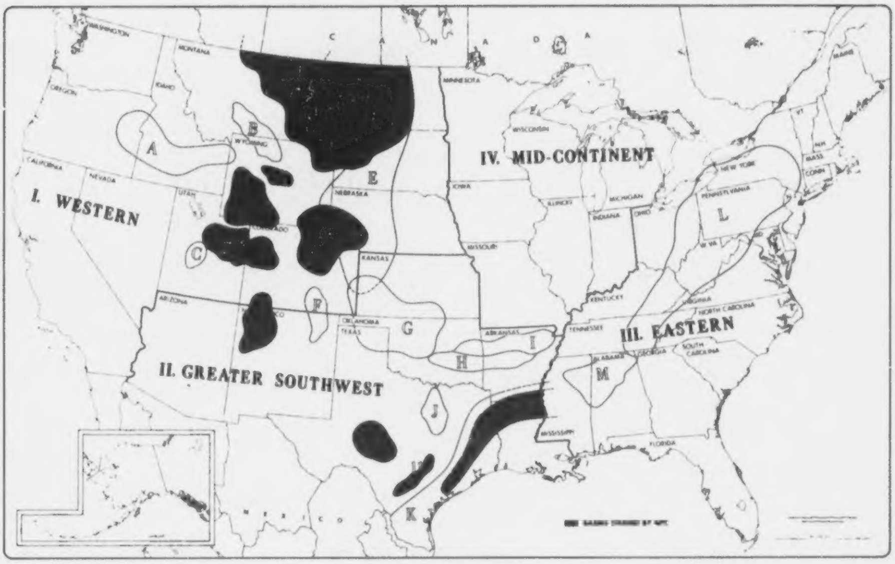
—The formation must have an estimated average *in situ* gas permeability throughout the pay section of 0.1 millidarcy or less.

—Production rates of wells completed in the formation must not exceed a flow rate, without stimulation, specified by the FERC for different depth intervals, and cannot produce more than 5 barrels of oil per day.

The Resource

Few resource estimates have been made for natural gas from tight formations. All but the most recent study (National Petroleum Council, 1980) have included only specified western interior basins without extrapolating for additional U.S. onshore and offshore areas. Figure 30 shows the location of the major basins and regions considered by the National Petroleum Council (NPC) to have tight-gas potential. Estimates of the tight-gas resource were made by a detailed formation by formation study of 12 basins (shaded in fig. 30) which account for approximately 35 percent of the total U.S. area believed to contain prospective tight-gas. Estimates were extrapolated for the remaining 65 percent of potential tight-gas areas by using basin analogs. Total in-place estimates were 444 Tcf for the 12 appraised basins and 480 Tcf for the extrapolated areas, giving a combined total of 924 Tcf for the potential tight-gas resource (table 30). Estimates for the appraised basins represent higher levels of confidence by the NPC than those for the extrapolated areas and, consequently, represent nearly half of the maximum recoverable (293 Tcf of 608 Tcf or 48%) gas. Estimates for ultimately recoverable tight-gas were made assuming four different gas prices, a 15 percent discount rate of return and two levels of technology (table 31). The base technology case was modeled after a well spacing of 160 acres and well stimulation producing 1,000-foot fractures (measured from well bore to fracture tip). The advanced technology case involved 12 wells per section, or 53-acre spacing, and fracture lengths of 4,000 feet. The advanced technology scenerio is estimated by the NPC to take 6-10 years of intensive research and 4-8 years of development before widespread application can be achieved. The contribution of recoverable gas resource by advanced technology is substantial, increasing the ultimately recoverable gas by 37 to 74 percent over the base case. The NPC estimates a range of 192 to 574 Tcf for ultimately recoverable tight-gas resource for the total U.S. (excluding Alaska). The low estimate of 192 Tcf is derived assuming $2.50/Mcf and the base technology scenerio. The high estimate of 574 Tcf assumes a price of up to $9.00/Mcf and advanced technology.

A study by Lewin and Associates (1978) analyzed the



I WESTERN REGION
GREAT PLAINS APPRAISED
1. NORTHERN GREAT PLAINS
2. WILLISTON
ROCKY MOUNTAIN APPRAISED
3. GREATER GREEN RIVER
4. WIND RIVER
5. UINTA
6. PICEANCE
7. DENVER

OTHER KNOWN WESTERN
A. SNAKE RIVER
B. BIG HORN
C. WASATCH
D. DOUGLAS CREEK
E. WESTERN SHALLOW
CRETACEOUS TREND
II GREATER SOUTHWEST REGION
SOUTHWEST APPRAISED
8. SAN JUAN
9. VAL VERDE-OZONA TREND
10. VAL VERDE-SONORA TREND
11. EDWARDS LIME TREND
12. COTTON VALLEY TREND

OTHER KNOWN SOUTHWEST
F. RATON
G. ANADARKO
H. OUACHITA
I. ARKOMA
J. FORTH WORTH
K. WESTERN GULF COAST
III EASTERN REGION
L. APPALACHIAN
M. BLACK WARRIOR

Figure 30 — Basins with gas in tight formations
(National Petroleum Council, 1980)

potential ultimate recovery for the thirteen basins or provinces as shown in figure 31 (areas A through E and 1 through 8). Assuming the technology present at the time of the study and a gas price of $1.75 (1977 dollars) per Mcf, they estimated ultimately recoverable gas to be 70 Tcf. With reasonable technological improvements and a gas price of $3.00 (1977 dollars) per Mcf, ultimate recovery was estimated to be 188 Tcf. For purposes of comparison, the 1977 dollar prices were adjusted by the NPC to January 1, 1979, prices (table 31). In a rough comparison between the two studies, the NPC estimates appear substantially more optimistic, especially for the base case. The larger NPC estimates are due to a number of factors. First, the difference in areas appraised. The NPC analyzed 12 basins versus 13 for the Lewin study, and although 11 basins were the same, the NPC geologists evaluated 33 percent more sections. Second, there were differences in what each study considered as base and advanced technology. The larger estimates by the NPC reflect both the larger area evaluated and "increasing technical optimism of engineers two years later" (National Petroleum Council, 1980). The closer agreement in the advance case estimates is because of a 15-30 percent higher recovery efficiency expected in the Lewin study and the discounting by the NPC for poor quality portions of producing fields in their larger prospective area.

The NPC and the Lewin studies are the most comprehensive to date, but additional studies have been made. A recent study by the Gas Research

Table 30 — Comparison of estimated total U.S. in-place tight-gas resource and recoverable resource (Tcf)

	Total Gas In-Place	Technically Recoverable	Maximum Recoverable
Sharer (GRI) (1980)	(not reported)	30-150	(not estimated)
National Petroleum Council (1980)			
12 Appraised Basins	444	97-271	293
101 Extrapolated Basins	480	95-303	315
Total	924	192-574	608
Lewin and Associates (1978)			
13 Basins	409	70-188	(not estimated)
National Gas Survey Task Force on Nonconventional Natural Gas Resources, Federal Energy Regulatory Commission (1978)			
5 Basins	793	(not estimated)	(not estimated)
National Gas Survey Task Force U.S. Federal Power Commission (1973)	600	240-300	(not estimated)
Rice (1978)			
Northern Great Plains Province	100	(not estimated)	(not estimated)

Table 31 — Estimates of recoverable tight gas (Tcf)

Lewin and Associates (13 Basins) (1978)

January 1, 1979, Price*	$2.12	$3.64	$5.45
Base Technology	69.7	100.3	107.5
Advanced Technology	149.3	181.5	187.7

National Petroleum Council (1980)

January 1, 1979, Price	$2.50		$3.50		$5.00		$9.00	
Number of Basins	12	113	12	113	12	113	12	113
Base Case**	98	192	137		164	364	193	408
Advanced Case**	144	333	192		229	500	271	574

Sharer (GRI) (1980)

1979 Dollars	$3.12	$4.50	$6.00
Existing Technology	30	45	60
Advanced Technology	100	120	150

*Lewin estimates were made using mid-1977 dollar prices which, for purposes of comparison, were adjusted to January 1, 1979, levels by NPC utilizing the IPAA price index for drilling and equipping wells.

**Assumes a 15% discount rate of return.

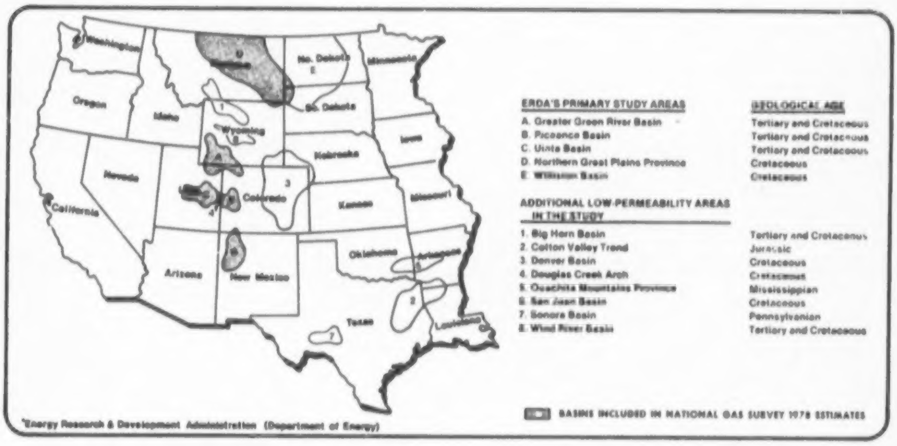

Washington
Oregon
California
Idaho
Nevada
Wyoming
Utah
Colorado
Arizona
New Mexico
No. Dakota
So. Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
ERDA'S* PRIMARY STUDY AREAS
A. Greater Green River Basin
B. Piceance Basin
C. Uinta Basin
D. Northern Great Plains Province
E. Williston Basin
GEOLOGICAL AGE
Tertiary and Cretaceous
Tertiary and Cretaceous
Tertiary and Cretaceous
Cretaceous
Cretaceous
ADDITIONAL LOW-PERMEABILITY AREAS IN THE STUDY
1. Big Horn Basin
2. Cotton Valley Trend
3. Denver Basin
4. Douglas Creek Arch
5. Ouachita Mountains Province
6. San Juan Basin
7. Sonora Basin
8. Wind River Basin
Tertiary and Cretaceous
Jurassic
Cretaceous
Cretaceous
Mississippian
Cretaceous
Pennsylvanian
Tertiary and Cretaceous
BASINS INCLUDED IN NATIONAL GAS SURVEY 1978 ESTIMATES
*Energy Research & Development Administration (Department of Energy)

Figure 31 — Location of Western tight sands (After Kuuskraa, et al., 1978)
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Table 32 — Comparison of estimates of gas resources in tight sandstones

	National Gas Survey Task Force U.S. Federal Power Commission (1973) (after Meyer, 1977)			Lewin and Associates (1978)	
	Depth interval	Area	Gas in place	Area	Gas in place
	(ft)	(mi²)	(Tcf)	(mi²)	(Tcf)
Piceance basin					
Category 1	5,600- 8,750	550	103.2		
Category 2	5,600- 8,750	650	103.9		
Total		1,200	207.1	855	35.5
Green River basin					
Category 1	8,000-12,000	140	37.1		
Category 2	9,500-15,800	500	108.4		
Category 3	9,000-12,000	500	94.5		
Total		1,140	240.0	870	90.5
Uinta basin					
Category 1	8,000-11,000	300	101.6		
Category 2	8,000-11,000	200	47.5		
Total		500	149.1	996	50.2
TOTAL		2,840	596.2	2,721	176.2

Institute (Sharer, 1980) estimates that 30 to 150 Tcf of gas are recoverable within a range of $3.12 to $6.00 per Mcf and using two levels of technology (table 31). No estimates were reported for total gas in-place.

In 1973, a National Gas Survey (N.G.S.) Task Force of the U.S. Federal Power Commission (now the Federal Energy Regulatory Commission) focused on the potential within the Mesa Verde, Ft. Union and associated formations of the Piceance, Green River and Uinta basins (A, B, C, figure 31) (U.S. Federal Power Commission, 1973). Using volumetric comparisons, the N.G.S. report concluded that as much as 600 Tcf of gas is in place within the three basins (table 30), but cautioned that this was only an order-of-magnitude estimate. As shown in table 32, the 1973 N.G.S. Task Force qualified its estimates by reporting gas-resource figures in three confidence categories reflecting the reliability of supporting data. Category 1 indicates reasonable certainty based upon firm well control. Whereas, Category 3 includes more speculative resources. The N.G.S. study also concluded that 40 to 50 percent of the estimated 600 Tcf of gas in-place could ultimately be recovered using advanced stimulation techniques. In contrast to this study, estimates by Lewin and Associates for the same three basins were markedly smaller, namely, 176 Tcf of gas in-place instead of 596 Tcf. They cited two major factors for this decrease. First, more recent drilling and analysis showed that the net pay thicknesses of the tight formations were less than one half that initially estimated by the N.G.S. Task Force. Second, research had shown that the gas saturation and gas-filled porosities were much lower than estimated by the N.G.S. Task Force.

A more recent review of potential gas in tight formations was made by a second advisory task force (National Gas Survey Task Force on Nonconventional Natural Gas Resources) to the Federal Power Commission (now the Federal Energy Regulatory Commission) in 1977 (Harbaugh, et al., 1977, p. 91). The final report was published in 1978 by the Federal Energy Regulatory Commission. This report concluded that the 600 Tcf in-place resource estimated in 1973 was a valid approximation, yet cautioned that subsequent tests had encountered reservoir flow capacities far below those previously predicted. Therefore, while the total resource in-place may have remained unchanged, its attractiveness as a production target and, thus, the volume of ultimately recoverable gas, is considerably diminished. The 1978 report added two other areas with the potential tight sandstone gas resources to the three established previously: (1) the northern Great Plains province of Montana and the Dakotas, containing an estimated 130 Tcf of gas in-place; and (2) the San Juan basin of northern New Mexico with approximately 63 Tcf of gas in-place. The total potential in-place resource from all five areas then becomes 793 Tcf (table 30).

Finally, Rice (1978) has prepared a separate estimate for the northern Great Plains province. He has appraised the total gas in-place within the shallow reservoirs at 100 Tcf.

Current Research and Development

Recent research and development relative to the potential gas resource of tight sands has concentrated on enhancement of reservoir drainage and formation evaluation. Two methods of enhancing reservoir drainage through the development and maintenance of extensive fracture systems have been investigated: nuclear-explosive stimulation and massive hydraulic fracturing.

Since 1967, three nuclear stimulation experiments have been conducted: the Rio Blanco and Rulison Projects in the Piceance basin, and Project Gasbuggy in the San Juan basin. The objective in all three tests was to create a rubble chimney which would act as an enlarged wellbore pressure sink to provide vertical communication between sandstone reservoirs otherwise isolated by interbedded shales (Luetkehans, 1976; Harbaugh, et al., 1977, p. 72; and Stosur, 1977).

Though these tests demonstrated the technical feasibility of using nuclear explosives to stimulate gas production, the resulting productivity fell far below expectations. Three reasons for this have been postulated (Stosur, 1977, p. 712): (1) The matrix permeability of host formations was grossly overestimated by anywhere from 1 to 10 orders of magnitude depending on the test; since 99 percent of the projected drainage area was intentionally beyond the effects of the fracturing, it remained dominated by ultra-low matrix permeability (about 0.001 md for Project Gasbuggy versus the predetonation estimate of 0.1 md); (2) the post-explosive closing of newly-created unsupported fractures and greater water influx result in decreased relative permeability to gas; and (3) glazing of the explosion cavity by melting rock.

The National Gas Survey study (Federal Energy Regulatory Commission, 1978) reported that stimulation by nuclear-explosive fracturing did fall within the inferred range of enhancement and also found that it was economically comparable to alternative techniques. Stosur, on the other hand, found nuclear stimulation about one order of magnitude more expensive than massive hydraulic fracture treatments (1977, p. 699). The questionability of the effectiveness of nuclear stimulation, its expense relative to other stimulation techniques, and most important, the tremendous public concern about the dangers of radiation have reduced the earlier interest in pursuing nuclear stimulation techniques. There are currently no active plans for additional research and development in this area.

As an alternative to nuclear-explosive fracturing, massive hydraulic fracturing has emerged as a viable method for stimulation of tight sandstone reservoirs. Massive hydraulic fracturing is an amplification of older hydraulic fracturing techniques and involves the pumping of large volumes of fluids and proppant into a well under high pressure to create and maintain fractures up to thousands of feet long and hundreds of feet high. Today, typical massive hydraulic fracture treatments involve from 100,000 to 1,000,000 gallons of fluid and up to 2.5 million pounds of proppant (National Petroleum Council, 1980). This technique has been most successfully employed in the blanket-type formations of the Cotton Valley, Denver, Green River, San Juan and Sonora basins. In some cases, effectively propped fractures several thousand feet long have been achieved. However, significant advances in technology must be made before widespread, effective application of massive hydraulic fracturing can be accomplished in all basins. Advanced technology is particularly necessary in lenticular-type formations where several potential pay zones may not even be penetrated by the wellbore, and extensive fractures are necessary in order to provide conduits along which gas can reach the wellbore.

There is considerable activity among petroleum service companies, individual research departments of major companies, and the academic community toward improved formation-evaluation techniques for shaly sands. The thin, discontinuous nature of such potential reservoirs in conjunction with their exceedingly low permeabilities stretches available formation evaluation technology to its limit. For example, the effective permeability of the Gasbuggy reservoir was about 1/20th of what was predicted based upon standard industry methods of low pressure measurement on dried core plugs (Randolph, 1976b, p. 183). Similar uncertainties arise in attempting to estimate the net and associated water saturations within a large vertical interval (Randolph, 1976a, p. 162).

Obstacles to Commercialization

There are both economic and technical barriers to the large-scale development of natural gas within tight sands, but no insurmountable political, legal, or social obstacles appear to exist.

Technological problems center around the previously mentioned stimulation methods and formation evaluation research. The extremely low permeabilities, together with the lenticularity of many tight-sand reservoirs, present problems in effective formation stimulation. Massive hydraulic fracturing will, hopefully, prove effective in most cases but, as yet, it has only been tested successfully in blanket-type sands. Additional technical problems are presented by the occasional presence of swelling clays and the inability to predict accurately the reservoir characteristics of tight sands. As yet, key parameters such as effective permeability, water and gas saturations and net pay can only be approximated. Such values must be known with relative certainty before expensive advanced-stimulation projects can be evaluated from an economic viewpoint. In addition, prediction and knowledge of fracture directions out from the wellbore would be advantageous in deciding on optimum well-site locations for effective field development. The volume of recoverable natural gas from tight sands is very closely linked to the cost of the stimulation procedure and to the sale price of gas.

Conclusions

An in-place resource of at least 924 Tcf of gas probably exists within the tight-sand reservoirs of the U.S. Between 192 and 574 Tcf may ultimately be recovered given reasonable prices for natural gas and normal improvements in technology. The western basins alone contain 409 to 793 Tcf with ultimately recoverable resource estimated at 30 to 300 Tcf.

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NATURAL GAS FROM DEVONIAN SHALES

Organic-rich shales of Devonian age underlie a major portion of the Appalachian, Michigan and Illinois basins. They represent the marine part of a delta which built westward during the Devonian period (about 350 million years ago). These organic-rich shales are reported to contain between 5 and 25 percent organic matter by Duncan and Swanson (1965), but W. F. Morse (private communication, 1981) indicates that about 10 percent of the samples analyzed by Columbia Gas System Service Corporation have an organic content of less than 0.5 percent. Deposition of these sediments occurred over most of the mid-continent region. Tectonic uplift and erosion has decreased the areal extent of these shales to present-day levels, and their preservation is most pronounced in basinal areas. In regions of these basins where these shales have undergone a sufficient thermal history (via burial) to effect maturation of their organic material to gas, a potentially large natural gas resource exists.

Figure 32 illustrates the areal extent of the Devonian shales considered by the National Petroleum Council (1980) to be gas-bearing. The resource base underlies approximately 175,000 square miles (453,000 square kilometers) mostly at depths ranging from 1,000 to 6,000 feet (610 to 1,830 m). These shales have a long history of natural gas production which has been of considerable local importance and are best classified as an underdeveloped, rather than nonconventional, resource. The legal and environmental problems associated with gas production from Devonian shales are the same issues confronting exploitation of conventional gas resources and are not considered to be significant hindrances to large scale commercialization. Underdevelopment of the Devonian shales is largely due to economic limitations. Exploitation involves large capital expenditure, and, although gas production is long-lived, the low flow rates achieved from wells result in a low rate of return on investment.

The first U.S. well drilled specifically for natural gas produced gas from Devonian shales near Fredonia, New York, in 1821, 38 years prior to Drake's historic oil well (McCaslin, 1978, p. 175). Since 1921, relatively modest volumes of natural gas have been commercially produced from Devonian shales. Currently, the most significant producing areas are in Ohio, West Virginia and Kentucky, with the latter two being of prime importance. Present production is estimated to be about 100 Bcf per year (Kuuskraa and Meyer, 1980). Actual shale production for Devonian shales may, in fact, be lower due to co-production from other zones. Brown (1976, p. 86) has estimated that 10 to 25 percent of gas production attributed to Devonian shales may actually be derived from overlying Mississippian carbonates and sandstones.

The Resource

Devonian shale matrix is characterized by low porosities of generally 3 percent or less and very low permeabilities of .005 millidarcy or less (Smith, 1978). Consequently, gas production is controlled by permeable patterns, primarily fractures (naturally occurring or induced) with additional influence from silts. A fair correlation exists between potential production and organic-rich shale thickness, with most commercial production coming from the thick shales located in the southwestern portion of the Appalachian basin.

It is not known whether gas production from the Devonian shales is from desorption of gas from the matrix or from free gas trapped in natural fractures of the shale. Proponents of the hypothesis that production is from free gas believe that the contribution of gas desorbed from the matrix is negligible and not producible by conventional drilling. Research being carried out at Juniata College, however, has shown that gas is in adsorbed form (Smith, 1978). If this is, in fact, the case, then gas content is not a function of porosity. Evaluation of the nature of produced gas is necessary before the actual recoverable resource can be known with greater certainty. Lewin and Associates (1978) estimate that if matrix gas is actually desorbed from the organic matter, the gas resource is an order of magnitude larger than that estimated for free gas. It has been estimated that only 2 to 10 percent of the original gas in-place (adsorbed; free gas) is recoverable (Avila, 1976, p. 83; Brown, 1976, p. 86; Ray, 1977, p. 682). The remaining 90 to 98 percent of the total gas resource would require some form of in-situ process for liberation, such as crushing and heating or even retorting.

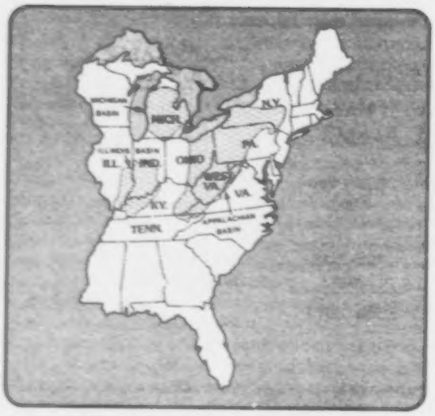

Figure 32— Geographic outline of potential Devonian shale areas. The area shown represents that portion within each basin considered by the Devonian Shale Task Group (National Petroleum Council, 1980) to have shale gas potential and does not necessarily represent the entire Devonian shales that exist in the basins (Source, National Petroleum Council, 1980)

Because of a general lack of complete geologic data and different estimation techniques, there is a wide variation in resource and recoverable resource estimates (table 33). Much of the variation in estimates reflects varying assumptions relative to the gas content, reservoir potential and drainage efficiency of the Devonian shales. Many geologists and engineers would consider the low estimates to be unnecessarily conservative and to reflect only a portion of the potential resource and potential area. They would also consider the high estimates to be unduly optimistic in extrapolating the productivity of currently producing wells over the entire prospective area. Much of the data used for resource estimates comes from the Appalachian basin where production has been in progress for many years. Little is known about the Illinois and Michigan basins and the lack of data makes estimation even more difficult. Direct extrapolation is not possible due to the differences between basins. Research conducted by the Eastern Gas Shales Project (a program sponsored by the Department of Energy) has reported the gas content of Applachian basin Devonian shale samples to have a mean value of .52 cu. ft./cu. ft. shale. This value is considered to be optimistic by Columbia Gas System Service Corporation which considers a mean gas content of about 0.2 cu. ft./cu. ft. shale to be more representative (W. F. Morse, private communication, 1981). Samples from the Illinois basin while having a higher organic content have a mean gas content of .42 cu. ft./cu. ft. shale due to a lower degree of thermal maturity. Analyses for the Michigan basin have yet to be made (Wise, 1979b).

A task group appointed by the National Petroleum Council (NPC) at the request of the Secretary of Energy has recently estimated the total in-place natural gas resource within the Devonian shales of the Appalachian basin to be from 225 to 1,860 Tcf (National Petroleum Council, 1980) (table 33). The low estimate of 225 Tcf was computed considering only the resource which might be present in the more highly organic-rich black shales. The high estimate of 1,861 Tcf is based on gas derived from both the richer black shales and the less prolific organic-lean gray shales. The task group used both published U.S. Geological Survey sample thickness figures (identified by color) and shale radioactivity as measured by gamma-ray well logs to determine black shale thicknesses. Gray shale thickness was derived by subtracting calculated black shale thickness from the total shale thickness. The resource estimates for the Appalachian basin were made using gas content values of 0.6 standard cubic feet of gas (scfg) per cubic foot of shale (cfs) for black shales and 0.1 scfg/cfs for gray shales. Total producible gas (regardless of price or technology) from Devonian shales in the Appalachian basin is estimated by the task force to be 50 Tcf. The task force also made estimates of total in-place gas resource for the Michigan and Illinois basins. Estimates for the Michigan basin were made using the same approach as for the Appalachian basin. In the Illinois basin it was not possible to differentiate between the black and gray shales, and a gas content value of 0.62 scfg/cfs was applied to the total shale thickness. A total of 160 Tcf of gas in-place was estimated for the Michigan and Illinois basins. Production data from these basins were thought by the task force to be insufficient for reliable estimation of recoverable resource.

Kuuskraa and Meyer's (1980) estimate for the Appalachian basin compares favorably with the NPC estimates and concludes that there are 400 to 2,000 Tcf of gas in-place. Eighty trillion cubic feet (80 Tcf) is considered to exist as free gas and of this, 10-50 Tcf is the ultimately recoverable resource. Kuuskraa and Meyer report total gas in-place within other basins to be 1,900 Tcf, or one order of magnitude larger than the NPC estimate for the Illinois and Michigan basins. Combining estimates of all basins, according to Kuuskraa and Meyer, gives a total gas in-place of between 2,300 and 3,900 Tcf.

The National Gas Survey Task Force on Nonconventional Natural Gas Resources (Federal Energy Regulatory Commission, 1978) considered 285 Tcf as a most likely gas in-place figure with 60 Tcf potentially recoverable. The U.S. Geological Survey (DeWitt,

Table 33 — Estimates of Devonian shale resource

STUDY	GAS IN-PLACE (Tcf)		RECOVERABLE RESOURCE (Tcf)
	Free Gas	Total Gas	
National Petroleum Council (1980)			
Appalachian Basin		225-1,860	50
Other Basins		160	(not estimated)
Kuuskraa and Meyer (1980)			
Appalachian Basin	80	400-2,000	10-50
Other Basins		1,900	(not estimated)
Total (Free and Adsorbed Gas)		2,300-3,900	10-50
Federal Energy Regulatory Commission (1978)			
Appalachian Basin		285	60
Lewin and Associates (1978)			
Appalachian Basin	80	—	46
Smith (1978)			
5-State Area in Appalachian Basin		206- 903	
U.S. Geological Survey (1976) (cited in DeWitt)		500- 600	(not estimated)

1976, p. 113) estimates that between 500 and 600 Tcf of total gas in-place exists within the Devonian shales. They did not make an estimate of recoverable resource. Smith (1978), of the Columbia Gas System Service Corporation, has published estimates of total gas in-place resource for a five-state area including West Virginia, Kentucky, Ohio, Pennsylvania and Virginia which range from 206 to 903 Tcf. This range in magnitude reflects varying assumptions relative to the gas content, reservoir potential and drainage efficiency of the Devonian shales. Even though estimates show a wide variation in ranges, they show relatively good agreement on what is considered to be recoverable.

Current Research and Development

The most persistent difficulty encountered in the production of natural gas from shale is the lack of adequate matrix permeability. Production is, therefore, confined to regions which have extensive natural permeable zones or where it is possible to induce fracturing by stimulation techniques. Historically, only about 5 percent of shale completions have had natural flows in commercial quantities. Approximately 40 percent of such wells had no measurable gas flow prior to stimulation, and 11 percent remained nonproductive even after stimulation (Ray, 1976, p. 682-683). The traditional stimulation method has been the use of openhole explosives. This technique has proven to be rather inefficient because of its limited radial effect and because it cannot be directed toward just the productive intervals but affects many others as well. During the last 10 to 15 years, conventional hydraulic-fracturing techniques have been adapted to shale-well stimulation. A study comparing these two stimulation techniques showed that conventional hydraulic-fracturing resulted in a 57 percent improvement in production relative to traditional shooting techniques. Maximum improvement was shown in wells producing less than 100 Mcf per day after stimulation and diminished with increasing production until no difference was observed between the two techniques in stimulated wells producing over 300 Mcf per day (Ray, 1976). Most recently, research has been directed toward testing more advanced techniques. Preliminary investigations in Kanawha County, West Virginia, showed a 230 percent average increase in production over traditional shooting methods for wells stimulated either through fracturing using a fluid combination of methanol, propanol and carbon dioxide or through shooting with liquid explosives. These results compared to an average increase of 80 percent in the conventional hydraulically-fractured wells relative to the ones stimulated with traditional shooting techniques (National Petroleum Council, 1980).

Research is also being carried out to develop exploration techniques for finding gas in the Devonian shales. Since gas production is most successful in areas having extensive fracturing, it is advantageous to be able to know the cause of the fracturing and how it might be located. Structural studies of the Cottageville Gas Field located in western West Virginia indicate the possible association of fractures with basement fault movement. Preliminary investigations into the relationship of gas accumulations to geologic parameters carried out in the Big Sandy Field of eastern Kentucky show that production is related to preferential fracture directions in the shales. These fractures are postulated to be related to tensional stresses associated with basement faulting, especially thrust faulting (de Wys and Shumaker, 1979). While more research is necessary to prove these relationships, they may provide a means for predicting gas accumulations in the future (Wise, 1979a).

Extensive research related to the Devonian shale gas resource is currently being conducted by the Department of Energy and various industry organizations. In 1976, the Department of Energy (then ERDA) began the Eastern Gas Shales Project for the purpose of determining the potential gas resources for the Devonian shales and developing improved exploration and recovery techniques. In addition, the Gas Research Institute has been investigating shale properties fracture orientation and geometry and the effect of fracture and treatment fluids on shale formations. Development of the gas resource by drilling and application of advanced hydraulic and foam fracture techniques is actively being pursued by gas companies, especially Columbia Gas, Consolidated Natural Gas, Kentucky-West Virginia Gas Company, Mitchell Energy and Allegheny Land and Minerals (Sharer, 1980).

Obstacles to Commercialization

Economic factors are considered to be the most significant hindrance to large-scale commercialization. Despite the fact that Appalachian production is located near the large Eastern energy markets, deliverability rates and drilling costs interact to make even successful wells only marginally economic. While shale wells often outperform more conventional wells on a cumulative production basis, their slow rates of production result in a slow rate of return on invested capital, often requiring 7 to 12 years to pay out (Avila, 1976, p. 73). In addition, in any given year there is approximately a 25 percent cost increase in drilling average shale wells over the national average cost for similar, more conventional wells (Ray, 1977, p. 692). This additional expense may be attributed to locally rugged terrain, additional casing required to protect coal seams, and remote locations relative to many service companies. Under such conditions, the further cost associated with advanced stimulation techniques is often economically unsound.

Conclusions

Studies find an in-place natural gas resource ranging between 285 to 3,900 Tcf exists within the Devonian shales of the Appalachian, Illinois and Michigan basins. Estimates of ultimately recoverable resource using existing drilling and stimulation technology ranges between 10 and 60 Tcf for the Appalachian basin only. Recoverable resources have not been estimated for the other basins. The greatest hindrance to larger scale commercialization of this resource is the marginally favorable economic environment. This, in turn, is a reflection of the low permeabilities and modest production rates associated with shale wells.

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GAS HYDRATES

Gas hydrates were first brought to the attention of the petroleum industry by Hammerschmidt (1934) who noted that under certain conditions natural gas pipelines were plugged due to the formation of hydrates. Later reports by Soviet scientists (Makogon, 1965) stated that naturally occurring gas hydrates had been encountered in deep permafrost areas and that these hydrates represented possible gas resources of more than 535 trillion cubic feet (Chersky and Makogon, 1970). These reports and others around the world have greatly stimulated interest in gas hydrates.

Gas hydrates are an ice-like mixture of gas and water, a type of clathrate, in which gas molecules are trapped by a framework or "cage" of water molecules (Pauling and Marsh, 1952). Gas hydrates form in a gas-fresh water system under univariant pressure/temperature conditions such that, depending on the pressure, hydrates can be stable from subzero temperatures to more than 30° Celsius (fig. 33). Impurities in natural gas (CO_2, C_2H_6, H_2S and C_3H_8) increase the hydrate stability field and the presence of salt (NaCl) decreases the hydrate stability field (Katz, et al., 1959).

Potentially, large quantities of natural gas (either biogenic or thermal methane plus ethane, propane and other light hydrocarbons) can be trapped in gas hydrates. Also, large quantities of free gas or other hydrocarbons can be trapped beneath impermeable gas hydrate layers. Due to the dimensions of the hydrate crystalline lattice, very light gases such as hydrogen and helium pass through the clathrate and cannot be trapped, whereas isobutane is the maximum-sized hydrocarbon which can be incorporated into the structure. Though hydrates are nonstoichiometric compounds, an ideal methane-saturated fresh water system at standard temperature and pressure can yield approximately 170 m^3 of free gas per m^3 of hydrate (or 132 ft^3/ft^3) (Makogon, 1969). These data indicate that gas hydrates could be a much greater resource per unit volume than conventional free-gas reservoirs at depths of burial less than 1,500 meters.

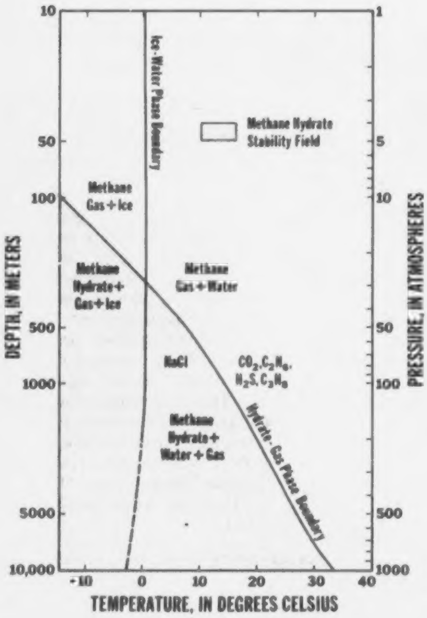

Figure 33 — Gas hydrate stability field (redrawn from Katz, et al., 1959, by Kvenvolden and McMenamin, 1980)

Theoretically, the proper conditions (high pressure, low temperature) for gas-hydrate formation exist in the geologic environment in permafrost areas and within marine seafloor sediments. Drilling in Arctic areas by the Soviets in the early to mid-sixties and in offshore areas by the United States in the seventies have confirmed the presence of gas hydrates in both environments. Early estimates of resources are subjective, at best, but all estimates indicate that gas hydrates are a possible enormous resource.

This paper will review the geologic occurrence and estimated resources of gas hydrates and present the numerous problems which are anticipated in exploiting this resource.

Geologic Occurrences of Gas Hydrates

Temperature and pressure conditions in the earth's crust vary, contrary to ideal conditions for the formation of gas hydrates. Hydrate formation is favored by high pressure and low temperature (generally less than 35° C.), but temperature in the earth's crust increases along a geothermal gradient with increasing depth of burial and overburden pressure. Therefore, gas-hydrate formation is limited to the shallow, cool regions of the crust where sufficient biogenic or thermal light hydrocarbons are available.

Permafrost Areas

Permafrost presently covers about 23% of the earth's landmass, including 75% of Alaska, 63% of Canada and 47% of the U.S.S.R. (Black, 1954). The depressed geothermal gradient in permafrost areas theoretically allows for gas-hydrate formation from about 200 to 1,000 meters below the surface (fig. 34).

Barraclough (1980) summarizes theoretical zones of hydrate stability (ZHS) for parts of Alaska, Canada and the U.S.S.R. (table 34). The average thickness of hydrate accumulations is about 700 meters, though considerable variation is noted. The bottom of the zone of hydrate stability reaches over 2,000 meters deep which is twice the depth calculated for an ideal methane-fresh water system. This greater than expected depth occurs because heavier hydrocarbons (C_2H_6, C_3H_8) and other gases (CO_2, H_2S) in the methane system extend the depth of gas-hydrate stability (fig. 33).

Known or inferred gas-hydrate accumulations in permafrost areas are shown on figure 35 (Kvenvolden and McMenamin, 1980). Table 35 summarizes evidence for gas hydrate accumulations in permafrost areas.

In the early 1960s the Soviets indicated that possible gas hydrates were encountered in drilling tests in Siberia. By 1969 to 1970, the development of the Messoyakha field, in which 54% greater gas by volume than anticipated from a free-gas accumulation was recovered from gas-hydrate formations, led to a resource estimate of 535 Tcf for gas hydrates in northeastern Siberia (Chersky and Makogon, 1970). Both gas hydrates and free gas trapped beneath the low-permeability hydrate layer are reportedly being produced in the Messoyakha field (Dobrynin, et al., 1979). Gas-hydrate production is being enhanced by the injection of methyl alcohol to induce dissolution (Oil and Gas Journal, 1978). Recent Soviet sources claim that there are more than thirty known gas-hydrate accumulations in Siberia (D. Sloan, personal communication, 1980).

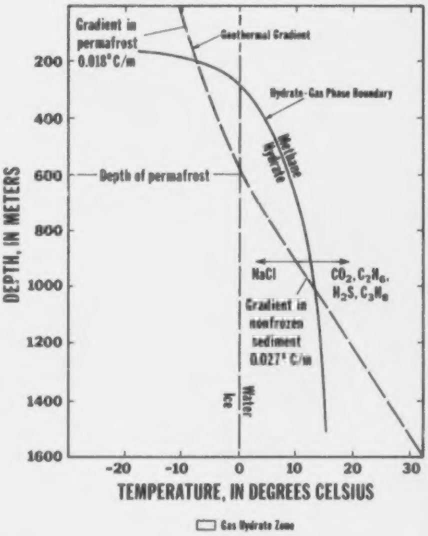

Figure 34 — Zone of gas hydrate stability in permafrost areas (redrawn from Bily and Dick, 1974, by Kvenvolden and McMenamin, 1980)

In 1971 to 1972, drilling in the North Slope of Alaska and Mackenzie Delta of Canada (Bily and Dick, 1974) encountered gas hydrates, but both sites yielded poor production tests. Drilling in Canada's Arctic Archipelago also encountered gas hydrates but no information is available on results of tests (Hitchon, 1974).

Until recently the presence of gas hydrates in permafrost areas was not conclusively proven. Gas-hydrate accumulations are generally inferred from drilling or well-log characteristics which are very similar to those encountered when drilling through normal permafrost layers:

(1) small or no spontaneous potential (SP) deflection on electric logs (due to low permeability of hydrate-cemented rock).

Table 34 — Zones of gas hydrate stability in permafrost areas
(for 0.6 gravity natural gas)
(Barraclough, 1980)

	Depth to Bottom of Permafrost (m)	Top of ZHS (m)	Bottom of ZHS (m)	Stratigraphic Thickness (m)
Alaska				
Cape Simpson	290	290	630	340
Cape Thompson	360	360	1,420	1,060
Point Barrow	400	400	1,020	620
Prudhoe Bay	610	610	1,220	610
Canada				
Resolute, N.W.T.	370	370	760	390
Mackenzie Delta	—	190	1,860	1,670
Sverdrup Basin	—	140	1,270	1,130
W. Arctic Islands	—	140	1,100	960
E. Arctic Islands	—	180	960	780
USSR				
Messoiakhskoe	450	450	1,050	600
Viliui	—	330	1,180	850
Markhin	1,440	100	2,200	2,100
Namanin	85	200	1,650	1,450
Olekmin	100	150	2,000	1,850
Ilychir	100	100	500	400
Sredne-Botuobin	620	100	2,000	1,900

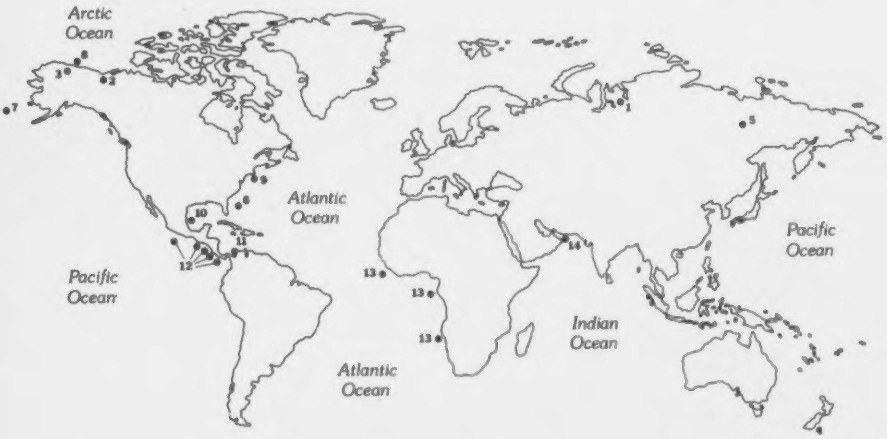
Arctic Ocean
Pacific Ocean
Atlantic Ocean
Atlantic Ocean
Indian Ocean
Pacific Ocean
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Figure 35 — Known and inferred gas hydrate accumulations
in permafrost areas (No. 1-5; Table 35)
in offshore areas (No. 6-15; Table 36)
(modified from Kvenvolden and McMenamin, 1980)

Table 35 — Gas hydrates in permafrost areas
(Kvenvolden and McMenamin, 1980)

Number on Fig. 3	Location	Permafrost thickness (m)	Predicted depth range of hydrate (m)	Geophysical evidence	Geochemical evidence	Research organization	References
1	Messoyakha gas field and northwestern Siberia, U.S.S.R.	450	250-870		90 pct. or more methane in gas analysis; large volume of gas from thawed cores.	U.S.S.R.	Makogon and others, 1971.
2	Mackenzie Delta, Northwest Territories, Canada	610	820-1100	Well logs: small deflection in SP; high resistivity; high velocity sonic log: over-gage caliper log.	do.	Imperial Oil Ltd.	Bily and Dick, 1974.
3	West of Prudhoe Bay, Alaska U.S.A.	610	210-1100	Well logs: high resistivities; high velocity sonic log; gas kicks in mud logs.	do.	Exxon	R. D. McIver, written commun., 1979.
4	Arctic Archipelago, Northwest Territories, Canada	530	No data in print.		No data in print.	Dome Petroleum Ltd.	Hitchson, 1974.
*5	Vilyuy Basin, Yakutia, U.S.S.R.	> 500	do.		do.	U.S.S.R.	Makogon and others, 1972.

*Up to 35 sites of gas hydrate accumulation are reported in northeast Siberia.

(2) high resistivity on electric logs (fresh water system).
(3) high sonic-log velocity (due to solid hydrate framework).
(4) over-gauge boreholes (hydrates are hard to drill but the borehole eventually enlarges due to decomposition and loss of wellbore support).

Gas hydrates can be distinguished from normal permafrost in instances where mud logs record high-level gas "kicks" in addition to the characteristics stated above. The Soviets also report a decrease in bottom-hole temperature and water freshening during gas hydrate recovery (Trofimuk, et al., 1980).

The first conclusive evidence of gas-hydrate formation in permafrost areas was obtained from pressured core samples from an ARCO/Exxon well on the North Slope of Alaska in the West Prudhoe Bay field (Kvenvolden and McMenamin, 1980). Pressures in the core barrel built up repeatedly after samples were withdrawn, indicating that hydrate decomposition was maintaining equilibrium pressures. The sampled gas was 93% methane and 7% nitrogen.

The presence of significant gas-hydrate accumulations in permafrost areas throughout the world indicates that there is a high potential for this resource in permafrost areas, though information on actual resources is speculative.

Submarine Sediments

Conditions within the marine environment seem to be significantly more favorable for gas-hydrate formation than conditions in permafrost areas. Ideally, gas hydrates can form in submarine sediments below about 500 meters of water (outer continental margin) to abyssal depths (fig. 36). Gas hydrates form at the sediment-water interface and the thickness of gas-hydrate accumulations increases with the height of the water column due to increased pressures (nearly 1,000 meters of hydrate form under 3,000 meters of seawater; fig. 36). This data indicates that conditions necessary for hydrate formation exist in about 90% of the world's ocean seabeds (A.G.A., 1979).

Theoretically, gas hydrates could form in the water column where natural gas is seeping from submarine sediments. But hydrates are lighter than seawater (0.81-0.93 g/cm^3) and would float up to warmer zones in the water column and dissipate.

It is important to emphasize that different processes are active in the marine environment compared to permafrost areas. Biogenic gas is being formed in recent submarine sediments below the sediment-water interface which are also within a hydrate stable environment. This in-situ production and entrapment of gas could result in large accumulations of hydrates, possibly with free gas trapped beneath hydrate layers.

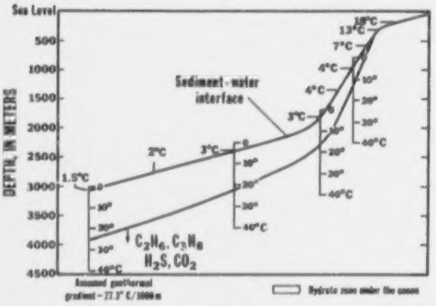

Figure 36 — Zone of gas hydrate stability in submarine sediments (Kvenvolden and McMenamin, 1980)

In 1971 United States' scientists theorized that an unusual seismic reflection shield encountered by the Deep Sea Drilling Project in the Blake-Bahama Ridge of the Atlantic Ocean was caused by a phase change from hydrate to gas (A.G.A., 1979). Since then, efforts by United States' scientists and some Soviet, British and Canadian scientists, have revealed possible gas-hydrate accumulations in submarine sediments around the world (fig. 35; table 36). Zones of gas-hydrate accumulation which are predicted from geophysical evidence occur in water depths from 400-5,500 meters and are 500 to over 1,000 meters thick (table 36). Predicted depths agree well with theoretical calculations (fig. 36).

Geophysical Evidence. Recognition of gas-hydrate accumulations in submarine sediments relies primarily on geophysical evidence. Bottom-simulating reflectors have been recognized in various marine locations where hydrates are theoretically stable (table 36). A bottom-simulating reflector (BSR) is an anomalous seismic reflection which parallels seafloor topography from 100 to 1,100 meters below the sediment-water interface (about 1/2 second below the seafloor reflection). The BSR is a reverse-polarity reflection between the base of high-velocity (2.1 km/sec), hydrate-cemented sediments and underlying, low-velocity sediments with interstital water and/or free gas.

Bottom-simulating reflectors parallel seafloor topography because the hydrate-stability field is controlled by the geothermal gradient, and isotherms generally parallel bottom irregularities. The sub-bottom depth to the BSR (100 to 1,100 meters) is proportional to water depth which controls pressure-temperature conditions, though pore salinity and gas composition can shift the hydrate-stability field and, hence, the BSR (Barraclough, 1980).

Table 36 — Gas hydrates in seafloor sediments
(Kvenvolden and McMenamin, 1980)

Number on Fig. 3	Location	Water depth (m)	Predicted sub-bottom depth range of hydrate (m)	Bottom-simulating reflectors (sub-bottom depth, m)	Other geophysical evidence	Geochemical evidence	Research organization	References
6	Blake-Bahama Outer Ridge, western Atlantic, off east coast of U.S.A.	3700	0-1000	about 500		90 pct. or more methane in gas analysis; large volume of gas from thawed cores.	Lamont-Doherty, DSDP, and USGS	Parkl and others, 1970; Ewing and Hollister, 1972; Dillon and others, 1980.
7	Bering Sea, North Pacific	2000-4000+	0->1000	580-670	VAMPs, >500 m beneath the seafloor.	90 pct. or more methane in gas analysis.	DSDP and USGS	Scholl and Creager, 1973; Scholl and Cooper, 1978.
8	Beaufort Sea, Arctic Ocean	400-2500+	0-700+	100-300		No data in print.	USGS	Grantz and others, 1976.
9	Western North Atlantic	2500-3800	0->1000	500-600		do.	Lamont-Doherty	Tucholke and others, 1977.
10	Western Gulf of Mexico	1200-2000	0-500	100-1100		do.	Univ. of Texas Marine Science Institute	Shipley and others, 1979.
11	Northern Colombian and northern Panamanian coasts	1500-3000	0-800	100-1100		do.	do.	do.
12	Central America, Pacific side; Western Mexico	800-2400	0-650	100-1100		Hydrates observed; greater than 5x volume of free gas evolved from thawed core.	Univ. of Texas Marine Science Institute; DSDP	Shipley and others, 1979; Moore, Watkins and others, 1979.
13	Western Africa	2000-5500	0->1000		Pagoda structures at very shallow depth.	do.	Woods Hole, Mass.	Emery, 1974.
14	Gulf of Oman	3000	0-800		Bright spots at 600-700 m depth.	do.	Cambridge, U.K.	White, 1979.
15	Black, Caspian Seas					Hydrates observed; large volume of gas from thawed core.	U.S.S.R.	Yeframova and others, 1974; Milton, 1977.

Bottom-simulating reflectors often intersect bedding reflectors where bedding is not parallel to seafloor topography. An example from the Blake-Bahama Outer Ridge (fig. 37) illustrates how well defined the BSR is under these conditions.

It is important to note that bottom-simulating reflectors can be caused by phenomenon other than gas-hydrate formation. Temperature-controlled diagenetic effects, such as the transformation of hemipelagic diatom ooze into indurated claystone in the Bering Sea, can cause a BSR on seismic profiles (Scholl and Creager, 1973). Also, not all gas-hydrate accumulations cause bottom-simulating reflectors, especially where stratification parallels seafloor topography.

Lithification of seafloor sediments and hydrate formation may be linked. Claypool and Kaplan (1974) state that gas-hydrate formation may influence carbon dioxide and methane activities which affect pore chemistry and, therefore, influence dissolution and reprecipitation of carbonate and silica cements.

Other seismic evidence of gas-hydrate accumulations includes velocity amplitude features (VAMPs). VAMPs are narrow (1-2 km) columns of velocity "pulldown" (a concave reflection horizon) associated with a gently arched high-velocity horizon at shallow depths (Scholl and Cooper, 1978). VAMPs are observed in the Bering Sea more than 500 meters below the seafloor in association with gas-hydrate accumulations (table 36).

Pagoda structures, alternating light and dark triangular features, form due to local centers of gas-hydrate induration in West Africa at sub-bottom depths of 2,000 to 5,000 meters (Emery, 1974).

Bright spots associated with free gas trapped beneath impermeable hydrate seals are observed in the Gulf of Oman (White, 1979).

Geologic-Geochemical Evidence. Direct observation of hydrated sediments supports geophysical evidence for gas hydrate accumulations. DSDP cores from the Blake Ridge yielded high volumes of methane in excess of amounts expected if only free gas were present (Ewing and Hollister, 1972).

The Soviets report that cores from the Black and Caspian Seas were spontaneously ejected from core barrels and that hydrate crystals were observed in rock cavities (Yefremova and Zhizhchenko, 1974; Milton, 1977).

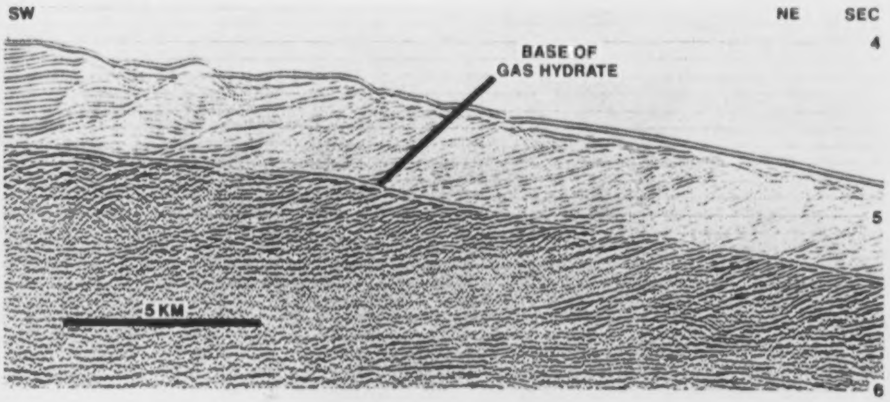

Figure 37 — Seismic profile showing gas hydrate accumulation on the east flank of the Blake Outer Ridge (Shipley, et al., 1979)

Gas hydrates were recently drilled by the Glomar Challenger at a site 100 kilometers southeast of Acapulco, Mexico, during Deep Sea Drilling Project Leg 66 (Moore, Watkins, et al., 1979). Hydrate-cemented sediments were observed on the deck before decomposing and more than five times the amount of free gas which could have been present was evolved from core samples.

Recognition of gas-hydrate accumulations in submarine sediments is in its infancy, but early evidence indicates that gas hydrates beneath the world's oceans may be a significant resource.

Gas Hydrates as Seals for Accumulations of Free Hydrocarbons

Evidence from around the world indicates that impermeable gas hydrate layers can trap free gas and other hydrocarbons in permafrost and marine environments (Makogon, 1974; Tucholke, et al., 1977; White, 1979; Shipley, et al., 1979; Hedberg, 1979; Dillon, et al., 1980). A close association of free gas and gas hydrates is expected since any change in geologic-geophysical conditions can result in the formation or dissolution of hydrates.

Several conditions of free gas-gas hydrate association can be developed:

(1) Updip migration of free gas into a zone of hydrate stability could result in self-entrapment of the gas (fig. 38).

(2) As sediments accumulate, hydrates formed near the surface will eventually be buried and encounter higher temperatures and dissolve. However, upward migration of the free gas will be halted by hydrate formation occurring in shallower horizons, so the free gas will be trapped and the reservoir will grow with time.

(3) Gas-hydrate layers often parallel sea floor topography since hydrate stability fields are determined by sub-bottom pressure and temperature conditions. Hydrocarbon traps can develop where hydrate layers form parallel to a dome or ridge on the sea floor. This type of trap is observed on seismic profiles on the Blake Ridge off southeast United States (fig. 39; Dillon, et al., 1980).

(4) Local variations in pressure-temperature conditions may also cause doming of the hydrate layer. Local increases in heat flow around salt domes beneath the continental slope of North Carolina seem to cause doming of hydrate layers which may be local traps for free gas (fig. 40; Dillon, et al., 1980).

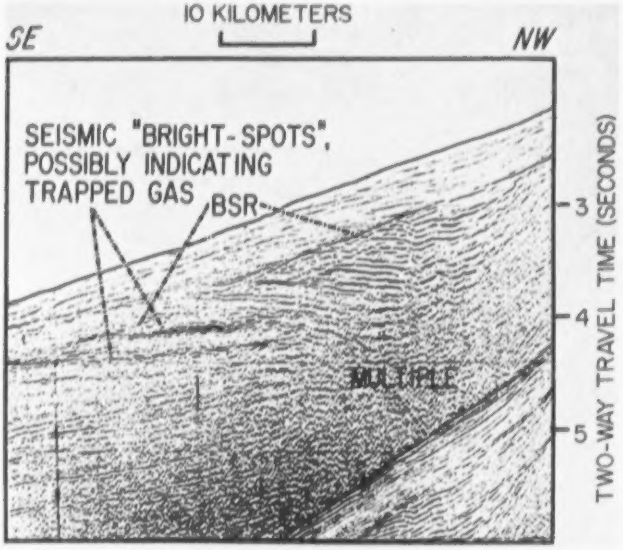
10 KILOMETERS
SE
NW
SEISMIC "BRIGHT-SPOTS", POSSIBLY INDICATING TRAPPED GAS
BSR
MULTIPLE
3
4
5
TWO-WAY TRAVEL TIME (SECONDS)

Figure 38 — Seismic profile showing gas hydrate accumulation in dipping beds (Dillon, et al., 1980)

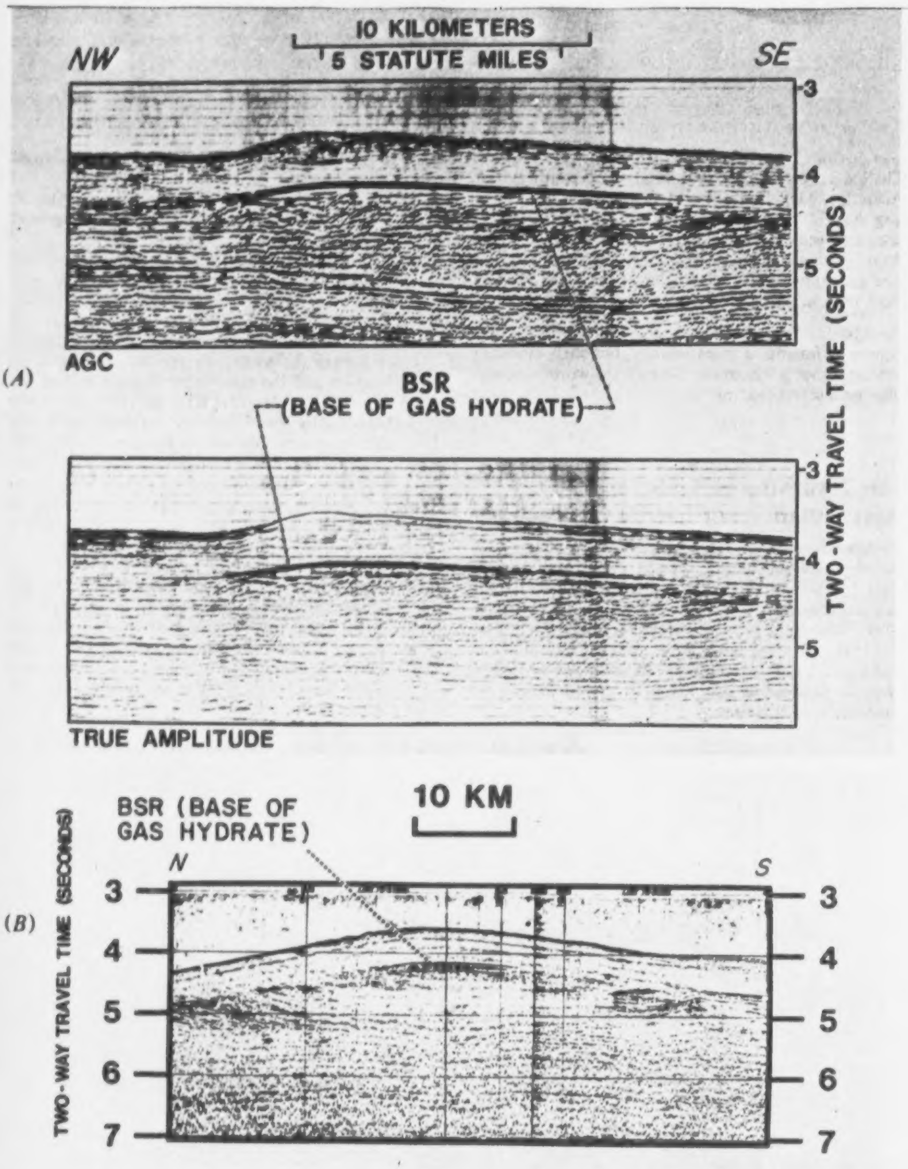

Figure 39 — Seismic profiles of the Blake Ridge showing BSRs (Dillon, et al., 1980)

A is a profile approximately along the axis of the Blake Ridge off North Carolina. This broad ridge extends diagonally away from the continental slope and contains exceptionally strong BSRs that probably represent gas hydrates.

B is a profile that crosses the ridge near the right side of the section shown in *A*.

(5) Large environmental or climatic changes could be responsible for regional hydrate formation or dissolution. Trofimuk, et al. (1977) cites convincing evidence that the retreat of the continental ice sheets at the end of the last ice age resulted in the dissolution of hydrates, and initiated the formation of many conventional giant gas fields in or near present permafrost areas. By similar reasoning, marine regressions could release marine hydrates into conventional onshore gas deposits.

Resource Estimates

Resource estimates for gas hydrates are highly speculative due to incomplete knowledge of hydrate occurrences and poor methods of estimating reserves in known occurrences. Conventional methods of estimating gas resources are not applicable to hydrate-bearing formations because:

(1) on conventional well-logs, hydrates have the same characteristics as permafrost.

(2) flow tests require a means to disrupt equilibrium

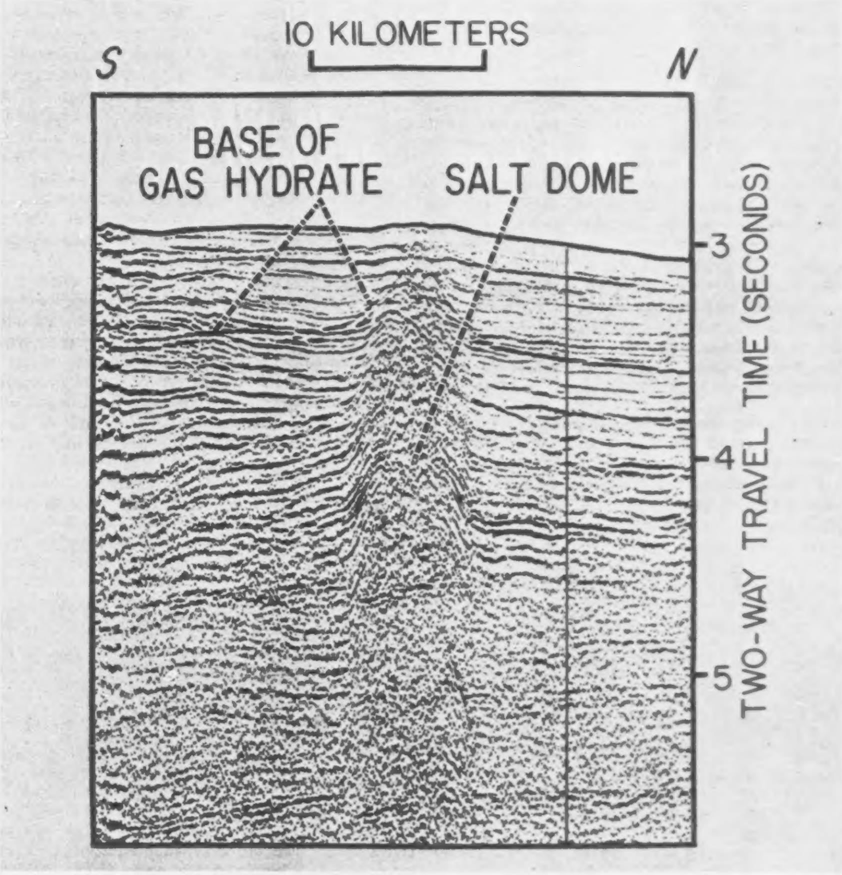

Figure 40 — Seismic profile showing gas hydrate accumulation flanking a salt dome
(Dillon, et al., 1980)

conditions and dissolve the hydrates.

(3) reservoir permeability is very low.

(4) the hydrate gas/free gas ratio cannot be fully determined from core samples or porosity estimates (Barraclough, 1980).

Nevertheless, regional and world estimates of gas-hydrate resources have been calculated by several workers (table 37). Soviet scientists attempted to incorporate many complex factors into their calculations, including regional and world coefficients of present and past temperatures, sediment thicknesses, percent of organic interval in the sediments and percent methane production and conservation (Trofimuk, et al., 1977).

World estimates for gas-hydrate resources range from 500 to 1,200,000 Tcf for permafrost areas and from 110,000 to 270,000,000 Tcf for ocean sediments. Estimates show considerable variation, but submarine sediments seem to be a much greater resource for gas hydrates due to in-situ production of biogenic methane and the extensive nature of stable pressure/temperature conditions favorable for hydrate formation. Estimates by Dobrynin, et al. (1979) are considerably higher than others. They describe their calculations as "rough estimates" based on permafrost coverage and physical zones of hydrate stability in the world's oceans without apparent regard for distribution of sedimentary basins or availability of natural gas. Their estimates should be considered a very optimistic upper limit.

None of these estimates seem to account for reservoir quality. Proved and currently recoverable world resources of conventional natural gas are 2,329 to 2,594 Tcf, and estimated total remaining recoverable resources are 7,900 to 9,200 Tcf (Parent, 1980). If only 1% of gas-hydrate resources are within porous and permeable strata, then the most conservative estimate for recoverable gas hydrates is still over 1,100 Tcf, or half of our proved and currently recoverable conventional gas resources. Also, these estimates do not consider possibly significant accumulations of free gas beneath hydrate layers.

Estimates for gas hydrate resources in the United States (table 38) were extrapolated from world estimates (table 37). Based on Soviet estimates for gas hydrates in Siberia, McIver (1979) calculates that Russian sedimentary basins in permafrost areas contain an average of 280 million cubic feet per square mile. Sedimentary basins in permafrost areas of Alaska cover about 83,000 square miles. A United States equivalent to gas hydrate resources in the U.S.S.R. based on McIver's (1979) ratio amounts to about 23 Tcf. Ratios from world estimates indicate that U.S. gas-hydrate resources in permafrost areas may range from 11 to 25,000 Tcf. The U.S. Geological Survey sponsored a gas hydrate workshop in Menlo Park, California on July 16-17, 1979, which targeted the National Petroleum Reserve of Alaska as a potential gas-hydrate resource area which should be evaluated (Goodman, 1980).

Estimates for gas-hydrates in submarine sediments offshore from the United States are restricted to shelf areas since they represent approximate legal and technological boundaries. Dobrynin, et al. (1979) suggest that approximately 35% of all submarine gas hydrates occur in the shelf zone. Continental shelf and slope areas cover about 20 x 10^6 mi² of the world (Weeks, 1974). United States shelf and slope areas amount to about 1.4 x 10^6 mi² (Cram, 1971). Therefore, the gas-hydrate resources in continental shelf and slope areas of the U.S. represent about 7% of the total world resource x 35% (shelf factor).

Table 37 — World estimates of gas hydrate resources

Continental	Oceanic	Reference
m³ (Tcf)	m³ (Tcf)	
5.7 x 10^{13} (2010)	5-25 x 10^{15} (1.8-8.8 x 10^5)	Trofimuk, et al., 1977
3.1 x 10^{13} (1100)	3.1 x 10^{15} (1.1 x 10^5)	McIver, 1979; adapted from Chersky & Makogon, 1970
≥ 1.4 x 10^{13} (500)	—	Meyer, 1979
3.4 x 10^{16} (1.2 x 10^6)	7.6 x 10^{18} (2.7 x 10^8)	Dobrynin, et al., 1979

Table 38 — Estimates of gas hydrate resources in the United States

Continental (Alaska) m³ (Tcf)	Oceanic* m³ (Tcf)	Adapted Reference
1.2×10^{12} (42)	$1.2\text{-}6.1 \times 10^{14}$ ($4.2\text{-}21 \times 10^{3}$)	Trofimuk, et al., 1977
6.5×10^{11} (23)	7.6×10^{13} (2.7×10^{3})	McIver, 1979; Chersky and Makogon, 1970
$\geq 3.1 \times 10^{11}$ (11)	—	Meyer, 1979
7.1×10^{14} (2.5×10^{4})	1.9×10^{17} (6.7×10^{6})	Dobrynin, et al., 1979

*Continental shelf and slope estimate only. Assumes 35% of oceanic gas hydrate resource occurs in this zone.

Estimates for gas hydrates in submarine sediments along U.S. shelf areas range from 2,700 to 6,700,000 Tcf, a sizeable resource even at the most conservative estimates.

Gas-hydrate resources in the U.S. and the world seem to be quite significant. It must be emphasized, however, that present estimates are very highly speculative and a large amount of further study of this resource is necessary before quasi-reliable estimates can be obtained.

Production Technology

Problems associated with identification of gas hydrate accumulations are compounded by a lack of production technology. Production problems are founded in a poor understanding of the fundamental properties of gas hydrates as they occur in nature, such as formation and decomposition in a porous media. To date, only the Soviets claim production of significant volumes of natural gas from permafrost deposits (Makogon, et al., 1971; Cieslewicz, 1971; Makogon, 1974). No reports of offshore production of gas hydrates have been issued.

Hydrated gas densities are too low for economic "mining" of the resource, so in-situ conversion of solid methane hydrate to free natural gas is the only feasible alternative. There are three main methods of hydrate dissolution:

(1) Pressure reduction
(2) Temperature increase
(3) Catalytic dissolution

In theory, Holder, et al. (SPE/DOE 8929, 1980) predict that with 60% energy efficiency and 90% gas recovery, the majority of gas-hydrate occurrences could be recovered with a net energy gain. However, many unsolved problems remain.

Injection or withdrawal of fluids to lower pressure, raise temperature or dissolve hydrates is time-consuming and difficult due to the very low permeability of hydrate-cemented sediments. All methods will require some form of stimulation such as hydraulic fracturing. The Soviets claim success at the Messoyukha field by injecting a freezing-point depressant, methyl alcohol, to dissolve the hydrates (Dobrynin, et al., 1979). However, the Soviets are extracting free gas as well as hydrated gas from the reservoir and they indicate that their operation is profitable only if gas hydrates occupy less than 10% of the pore space (with greater than 90% of the pores filled with free gas). It would seem that too much hydrated gas in pore spaces results in permeabilities which are too low for economic extraction. In addition to permeability problems, inhibitors such as methyl alcohol are costly, toxic, difficult to regenerate and highly volatile.

Temperature elevation is also costly and very slow due to permeability problems. This method might prove economic, however, in regions where hydrothermal fluids or deep brines are readily available as a heat source.

Additional problems associated with gas-hydrate production include large volumes of water which are released during hydrate decomposition. Also, for drilling through gas hydrates to underlying free gas reservoirs, casing seals with hydrate-cemented sediments are vulnerable to channeling and washout associated with hydrate decomposition (Bily and Dick, 1974; Goodman, 1980). Conventional coring methods are not feasible for hydrate-cemented sediments since pressure buildups during hydrate decomposition can result in core barrel explosions (Goodman, 1980). Drilling techniques in permafrost areas are discussed in more detail by Goodman (1978).

Other problems unique to the development of gas hydrates in submarine sediments include the difficulties of deep-water drilling and production, since hydrates are the primary sediment cement in otherwise unconsolidated sediments.

Present technology would indicate that production of free gas trapped beneath or in association with hydrate layers would be more feasible than the production directly from hydrates. Any decrease of pressure in free-gas reservoirs would result in further decomposition of the overlying hydrate layer to maintain reservoir pressure. In this manner, the hydrates might be indirectly produced.

The Gas Research Institute held a gas hydrate workshop in Denver on February 1, 1979, at which a consensus of information indicated that U.S. gas hydrate resources are largely undetermined and that development of feasible production techniques must be established (Goodman, 1980).

Obstacles to Commercialization

Major technological obstacles have prevented development of gas-hydrate resources and will continue to hinder development in the foreseeable future. Initial exploitation of gas-hydrate deposits may be restricted to production of free gas beneath hydrate layers.

Exploration and development of gas hydrates is being hindered by legal obstacles. Many permafrost areas in Alaska which may contain gas-hydrate resources are restricted from development by designation of wilderness areas and similar withdrawals by RARE II designations. Ownership of gas-hydrate resources in ocean areas beyond national boundaries has not been established by international law.

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PART III

REVIEW OF POTENTIAL CONVENTIONAL RESOURCES OF NATURAL GAS IN CANADA

CONTENTS

PART III. REVIEW OF POTENTIAL CONVENTIONAL RESOURCES OF NATURAL GAS IN CANADA

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REVIEW OF POTENTIAL CONVENTIONAL RESOURCES OF NATURAL GAS IN CANADA*

The Geological Survey of Canada has recently provided the following estimates of ultimately recoverable quantities of marketable natural gas in Canada. These are presented in four regions: Western Canada, the East Coast, the Mackenzie Delta-Beaufort Sea, and the Arctic Islands. The ultimately recoverable quantities for all of Canada are thought to be 420 trillion cubic feet (Tcf) on an average expectation (40 percent probability) and 581 Tcf on a highly speculative basis (5 percent probability). Almost 100 Tcf of gas have been found in Western Canada, possibly 4 Tcf in the East Coast, about 10 Tcf in the Mackenzie Delta-Beaufort, and 12 to 20 Tcf in the Arctic Islands. Proved and produced gas amounts to about 126 Tcf. Therefore, the average expectation for future gas potential in Canada is about 300 Tcf.

WESTERN CANADA BASIN

This region consists of the western Canada sedimentary basin in the provinces of Manitoba, Saskatchewan, Alberta and British Columbia. It extends from the Precambrian shield on the east to the Rocky Mountains on the west, south of 60° latitude, and is in a mature stage of exploration. Exploration to date has led to the discovery of more than 9,000 gas pools and over 3,200 oil pools. With the exception of the Disturbed Belt, the vast majority of these pools are stratigraphically controlled and the analysis of some 65 plays throughout the basin indicates that this trend will probably continue. Nonconventional gas reported in relatively tight rocks in the deep basin in western Alberta is excluded from these estimates.

Potential Evaluation

The relatively mature state of exploration is reflected in the estimates. The character of the resource probability curve (fig. 41) leaves a narrow range in the possible values for potential. For Western Canada, the estimate curves include major reserves plus potential. Thus the average expectation of 159 Tcf on the gas curve is made up of existing reserves of nearly 100 Tcf, plus about 62 Tcf of potential resource. At highly speculative levels, the undiscovered gas could be as high as 100 Tcf.

EAST COAST

The estimates of oil and gas resources for this region cover the area extending from the Scotia Shelf into the Baffin Bay basin. More than 125 exploratory wells have been drilled in this region since 1966 (fig. 42). This has resulted in the recognition of a major gas province near Sable Island and a narrow, dominantly gas, province extending along the coast of Labrador and probably into Baffin Bay. The estimates are based on the analysis of 32 plays primarily in the sedimentary wedge of Tertiary and Mesozoic age that thickens off the continental shelf. Important trap types include: salt-cored diapiric features, large roll-over faults, and fault blocks with overlying and flanking sands, as well as a multitude of stratigraphic traps involving carbonate and clastic pinch outs and erosional surfaces. Clastic sediments are generally deltaic, and, with the exception of the Hibernia area, contain organic material that is dominantly land-derived plant detritus. This, coupled with the relative geochemical immaturity, indicates the possibility that the East Coast will be dominantly a gas-prone region.

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*Review prepared by Donald W. Axford, D. W. Axford & Associates Ltd., and A. A. Wilkins, TransCanada PipeLines, Canadian observers to the Potential Gas Committee. Source: Procter, R. M., Lee, P. J., and Skibo, D. N., March 1981, Canada's Conventional Oil and Gas Resources: Geological Survey of Canada Open-File Release No. 767.

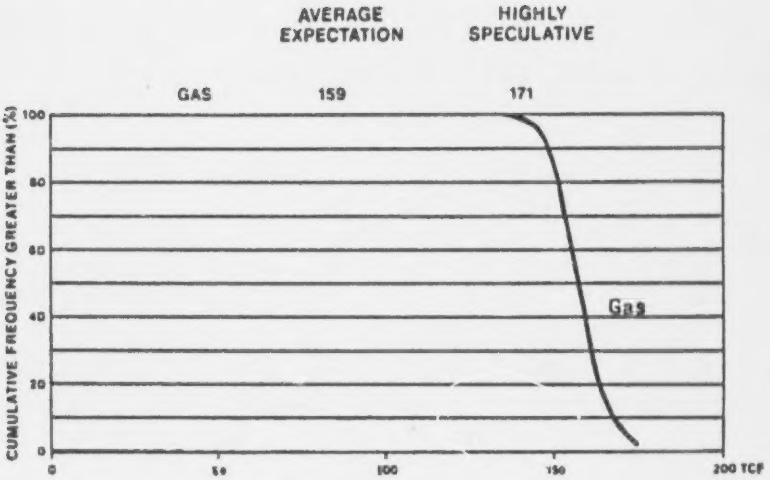

Figure 41 — Western Canada gas resources—cumulative probability curve

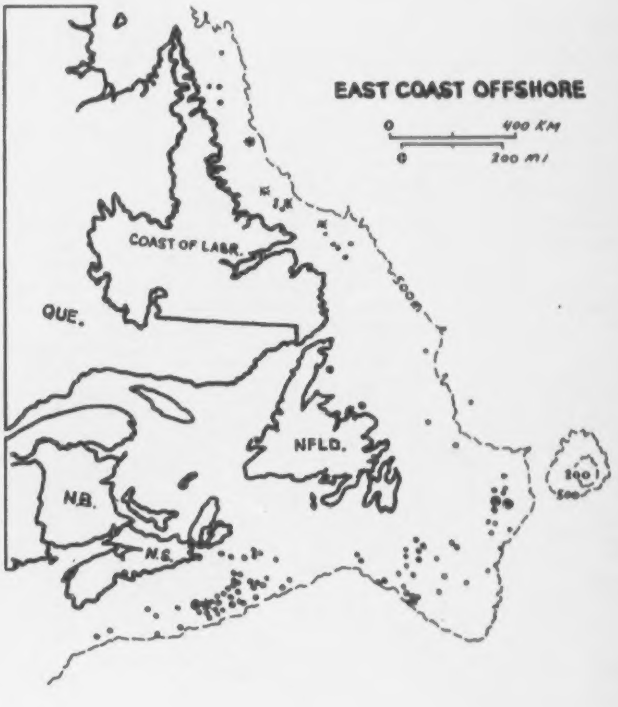
Legend
* Gas Discovery
● Oil Discovery
· Dry Hole
EAST COAST OFFSHORE
0
400 KM
0
200 MI
COAST OF LABR.
QUE.
NFLD.
N.B.
N.S.
500m
500

Figure 42—Location of exploratory wells and discoveries in the Canadian East Coast Offshore area

Potential Evaluation

The estimates of potential resources indicate an average expectation of approximately 72 Tcf of gas for the East Coast region and highly speculative potential for as much as 125 Tcf (fig. 43). No estimates of proved reserves are available at this time; however, commercial quantities of gas, probably exceeding one trillion cubic feet, exist at the Venture discovery. Individual discoveries along the Labrador coast, although exciting, are possibly too small to be economic at this time.

MACKENZIE DELTA-BEAUFORT SEA

This region includes the onshore part of the Mackenzie Delta and that part of the offshore extending to the edge of the continental shelf at a water depth of approximately 600 feet. It also extends from the Amundsen Gulf west to the Canada/Alaska boundary. The region is underlain by deltaic sandstones and shales of Mesozoic and Tertiary age which thicken rapidly northward to more than 40,000 feet a short distance seaward from the present delta. These clastics overlie faulted Paleozoic rocks which step down steeply beneath the Mesozoic-Tertiary cover. The Tertiary sequences contain the most important sandstone reservoirs, but additional reservoir rocks are present in both Cretaceous and Jurassic sands.

Major targets have been the diapiric structures formed by mud flow at depth, some of which attain great magnitude and/or linearity. Other targets result from closure provided by roll-over and growth faults, sometimes coupled with plastic deformation at depth. The main emphasis on drilling started on Richards Island near shore and then extended into the offshore region through the use of artificial islands. The targets are deltaic sands of the present and ancestral Mackenzie Delta. More recently, exploration has extended to the deeper Beaufort Sea region where drill-ships now test sedimentary wedges which were deposited in deeper water beyond the edges of ancient continental shelves. Parts of the region such as the area extending west to the Alaska boundary have received very little exploratory effort (fig. 44).

Geochemically the region can be characterized as thermally immature, with hydrocarbons derived from source rocks containing dominantly land-derived

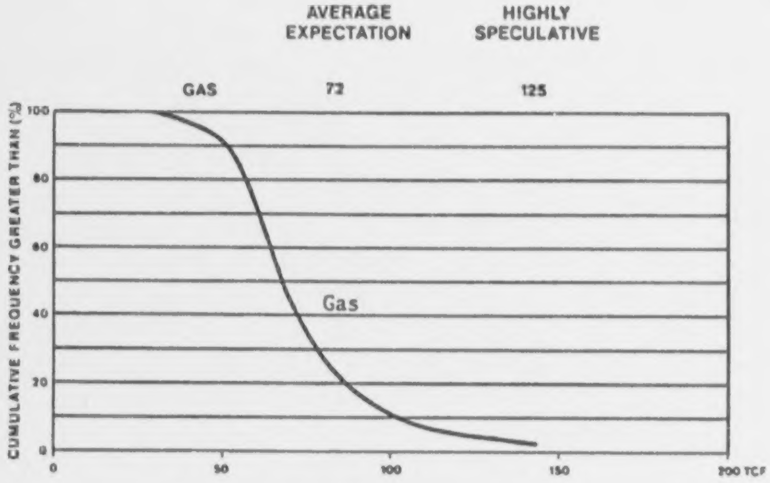

Figure 43 — East Coast gas resources—
cumulative probability curve

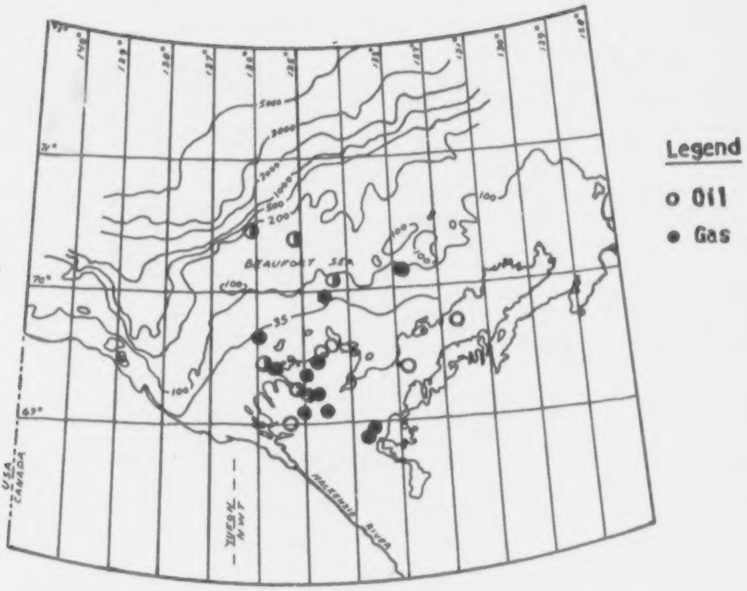

Figure 44 — Map of Mackenzie Delta-Beaufort Sea region showing location of oil and gas discoveries

plant material. These characteristics are inconsistent with the observed occurrences of liquid hydrocarbons and condensates. Current thinking is that an unusual concentration of resins derived from forests and capable of conversion to liquid hydrocarbons at relatively low temperatures may explain the geochemical enigma. As indicated by the estimate curves, the region is dominantly gas-prone but is also thought to contain more oil than any of the other frontier regions.

Potential Evaluation

In preparing the estimate of resources, 17 exploration plays have been assessed. The average expectation is 112 Tcf of gas. In the highly speculative range, these estimates extend to 147 Tcf (fig. 45). Estimates of discovered reserves are almost as speculative as those of undiscovered potential; however, without including Dome's recent activities in the Beaufort Sea, there is fair agreement that at least 6 Tcf of gas have been discovered — primarily in the Richards Island area. A more optimistic view would indicate there could be as much as 10 Tcf.

ARCTIC ISLANDS

The Arctic Islands region represents one of the most diverse areas for petroleum accumulation. Exploratory drilling began in 1961 in this large area, but half of which is covered by water. Since then, more than 140 exploratory wells have been drilled (fig. 46). Although exploration opportunities exist in rocks from the Precambrian through Mesozoic, by far the greatest activity has been focused on rocks of Jurassic age. This effort has resulted in discovery of two, and possible three, giant gas fields, as well as others in the one trillion cubic foot range, with total discoveries probably exceeding 15 Tcf of gas. Although there are indications that oil will occur in parts of the area in a variety of plays, evidence to date suggests that the Arctic Islands region will be dominantly a gas province. This situation relfects the basic geochemistry of the region, in which Mesozoic rocks are primarily immature with high concentration of land-derived organic material. Lower Paleozoic rocks, although having more oily source materials, have passed beyond the maturity level and now contain mainly gas.

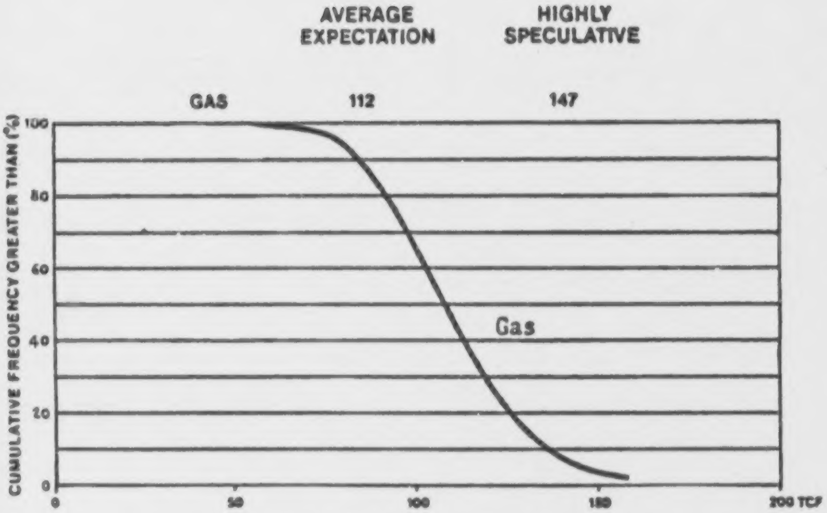

Figure 45 — Mackenzie-Beaufort gas resources—cumulative probability curve

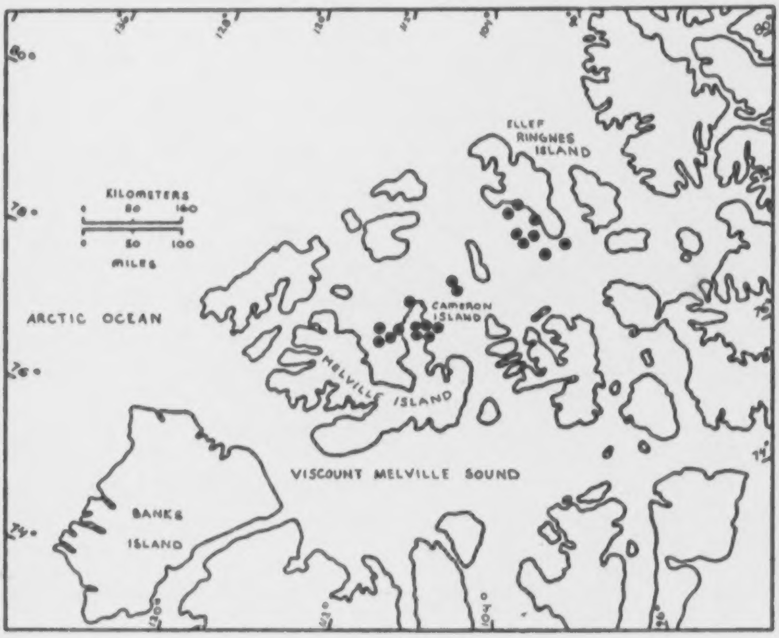
ELLEF RINGNES ISLAND
KILOMETERS
0
80
160
0
50
100
MILES
ARCTIC OCEAN
CAMERON ISLAND
MELVILLE ISLAND
VISCOUNT MELVILLE SOUND
BANKS ISLAND

Figure 46 — Arctic Islands hydrocarbon potential assessment area

Potential Evaluation

The current estimates of resources for this region include an average expectation of 87 Tcf of gas. At highly speculative levels, there could be 138 Tcf of gas (fig. 47). These estimates include an established reserve which probably ranges from a minimum of 12 Tcf and which, with effective delineation drilling, may prove to be larger than 20 Tcf. The estimates are the result of the analysis of 27 exploratory plays. Many of these have yet to be tested, so this introduces a large element of uncertainty and this is reflected in the distribution of estimates of potential.

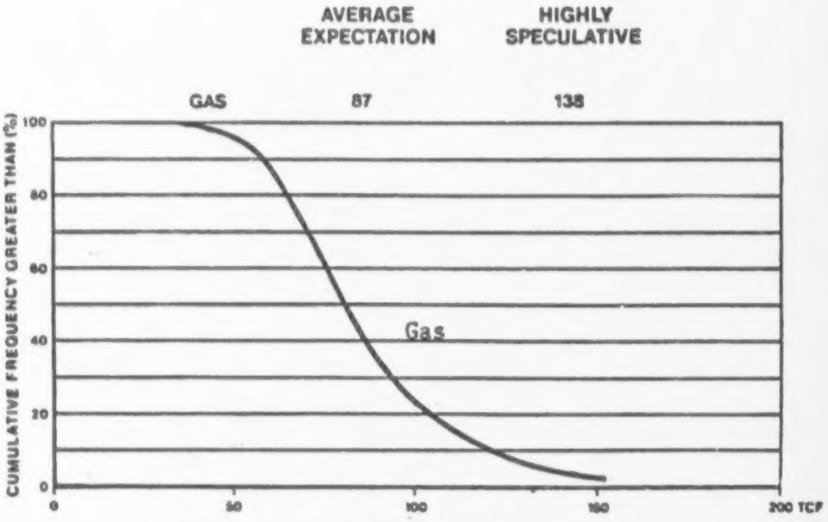

Figure 47 — Arctic Islands gas resources—
cumulative probability curve

PART IV

POLICY GUIDELINES AND MEMBERSHIP OF THE POTENTIAL GAS AGENCY AND THE POTENTIAL GAS COMMITTEE

CONTENTS

PART IV. POLICY GUIDELINES AND MEMBERSHIP OF THE POTENTIAL GAS AGENCY AND THE POTENTIAL GAS COMMITTEE

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POLICY GUIDELINES AND MEMBERSHIP OF THE POTENTIAL GAS AGENCY AND THE POTENTIAL GAS COMMITTEE

GENERAL POLICY STATEMENT

An appraisal of the long-range prospects of the natural gas industry in the United States — an appraisal that is useful for financial, managerial, and government purposes — requires, as an essential element, scientific, authoritative, and objective estimation of the potential supply of natural gas which may become available to the nation in addition to currently available proved recoverable reserves of natural gas. The Committee on Natural Gas Reserves of the American Gas Association, an industry committee, is fulfilling part of the need for information for future planning by providing periodic estimates of proved recoverable reserves of natural gas immediately available to the industry.

The Potential Gas Committee fulfills the remainder of this requirement by providing periodic estimates of the potential supply of natural gas which may become available. This Committee, together with its several Area Work Committees, is comprised of about one hundred fifty individuals from the production, transmission, and distribution segments of the natural gas industry who are knowledgeable with respect to the potential supply of natural gas.

The quantities of natural gas included in this report by the Potential Gas Committee are only those which are considered to be recoverable by technology currently available or feasible in the foreseeable future. There are additional, potentially recoverable, quantities of natural gas contained in such situations as gaseous coal seams, geopressured zones, certain brown shales, sandstones with very low permeability, and gas hydrates. Some workers have postulated large quantities of recoverable natural gas from each of these nonconventional sources, but there still remains considerable question as to the reasonable order of magnitude and the recoverability of this gas. These nonconventional sources largely have not been considered at this time by the Potential Gas Committee because the Committee feels that the technology of recovery has not yet been adequately demonstrated. As technological developments occur, the Committee will further study the potential from these sources and reconsider its estimates.

The Potential Gas Committee and its Area Work Committees discuss matters and data that are confidential. Fulfillment of the objectives of the Potential Gas Committee cannot be realized without the availability and utilization of information of a highly confidential nature. It is, therefore, the policy of the Potential Gas Committee and its Work Committees that every member, observer, and representative will respect such information and that there will be no disclosure of information or estimates, discussions, or other data, except as approved for release by the Potential Gas Committee.

A diagram of the organizational structure for the estimation of the potential supply of natural gas is shown in figure 68. A detailed description of the membership and duties of the several committees and of the Potential Gas Agency is presented in the sections which follow.

MEMBERSHIP OF COMMITTEES AND POLICY GUIDELINES FOR COMMITTEES

Gas Supply Committee of the American Gas Association

The membership of the Gas Supply Committee consists of representatives of member companies of the American Gas Association selected by the Chairman of the Board and approved by the Board of Directors of the American Gas Association.

GAS SUPPLY COMMITTEE
American Gas Association
W. J. Bowen, Chairman
Robert B. Kalisch, Staff Executive
Objectives, policy agency selection, financing, industry liaison.

POTENTIAL GAS AGENCY
Colorado School of Mines
Mineral Resources Institute
Supported by the American Gas Association
Harry C. Kent, Director
Approve criteria and methods, insure maintenance of standards and objectivity, review and evaluate reports, publish final estimate of potential gas.

POTENTIAL GAS COMMITTEE
George C. Grow, Jr., Chairman
Merlin A. Johnson, Secretary

E. Floyd Humphries, Chairman, Executive Committee
Charles L. Neumeyer, Chairman, Editorial Committee
Robert J. Cordell, Chairman, Committee on Definitions and Procedures
Richard J. Burgess, Chairman, Time and Site Committee

Under direction of Potential Gas Agency, outline study, establish criteria and methods, designate and instruct Work Committees, supervise, coordinate and compile estimates made by Work Committees.

Membership —
- (a) Chairman and Regional Vice Chairmen — appointed by Potential Gas Agency and approved by A.G.A. Gas Supply Committee.
- (b) Each Work Committee Chairman.
- (c) Department of Energy, Energy Information Administration, Federal Energy Regulatory Commission, Department of Interior Geological Survey, Bureau of Mines, NARUC, IOCC, and such other governmental agencies as the Gas Supply Committee and Potential Gas Agency shall approve — one non-voting observer each, and alternates, if desired.
- (d) Potential Gas Agency — Director — Ex officio.
- (e) Honorary technical advisors and members-at-large.
- (f) Gas Research Institute and Institute of Gas Technology — one non-voting observer each, and alternates, if desired.
- (g) Canadian and Mexican natural gas industry — one non-voting observer each, and alternates, if desired.
- (h) A.G.A., staff — one non-voting observer.
- (i) One Pipeline and one Distributor representative to be designated by the Gas Supply Committee.
- (j) Others appointed by Gas Supply Committee and approved by Potential Gas Agency.

REGIONAL VICE CHAIRMEN
AND AREA WORK COMMITTEES

Number of committees and assignments as designated by Potential Gas Committee and approved by Potential Gas Agency.

Under direction of Potential Gas Committee, prepare estimates for given assignment.

Membership —
- (a) Chairman — appointed by Chairman of Potential Gas Committee and approved by Potential Gas Agency.
- (b) Sufficient producer and other qualified members to insure proper representation for given assignment — appointed by Chairman of Work Area.
- (c) At least one Pipeline and one Distributor representative to be designated by Gas Supply Committee.

WESTERN REGION Charles J. Crowley, Chairman		**CENTRAL REGION** James K. Curry, Chairman		**EASTERN REGION** Robert W. Gallagher, Chairman	
Area	Chairman	Area	Chairman	Area	Chairman
H	James A. Barlow, Jr.	C	William E. Mantek	A	E. Perry Bendler
I	Robert D. Habbit	D	Paul Mounce	B	Billy C. Cook
K	Alexander Sisson	J-N	Alan F. Chatfield	E	Charles R. Brammell
L	William F. Edmondson	J-S	Charles M. Allen	G	Jeffery V. Morris

Figure 48 — Organization of Potential Gas Supply Studies

The scope of the committee is to coordinate, motivate, and make recommendations to the Board of American Gas Association as to the areas in which A.G.A. should become more active in the development of adequate gas supply for both short-term and long-term. In addition, the committee undertakes special projects, where necessary, to evaluate industry gas supply programs. The Gas Supply Committee oversees the work of the Potential Gas Agency.

The primary duties and responsibilities of the Gas Supply Committee with relation to potential gas studies include the following:

a. Establishing policy and objective.
b. Providing required financial support.
c. Maintaining liaison with industry and industry organizations.
d. Selecting the Potential Gas Agency.
e. Approving the appointment of the chairman and vice chairman of the Potential Gas Committee by the Potential Gas Agency.
f. Appointing pipeline and distributor representatives to the Potential Gas Committee and to each Area Work Committee.
g. Appointing such other members and observers to the Potential Gas Committee as may be necessary or advisable.
h. Assisting in procurement of qualified manpower to staff properly the Potential Gas Committee and the Area Work Committees.

The Gas Supply Committee of the American Gas Association takes no part in the work or the deliberations of the Potential Gas Committee or its sub-committees. The Gas Supply Committee does not participate in the studies leading to the estimates of potential supply of natural gas, and it neither approves nor disapproves the definitions and procedures, the estimates, or the report.

Potential Gas Agency of the Colorado School of Mines

The Potential Gas Agency is supported by the American Gas Association. The American Gas Association is free, however, to take independent views of the operations of the studies produced by the Agency and its committees.

The Potential Gas Agency includes the following:

a. A director, appointed by and responsible to the Colorado School of Mines.
b. Such additional staff personnel as may be required.
c. Members of the faculty of the Colorado School of Mines or other qualified individuals who may, from time to time, provide such professional services as the director of the Potential Gas Agency and the chairman of the Potential Gas Committee may determine necessary or desirable for discharging the duties of the Potential Gas Agency and the Potential Gas Committee.

The primary duties and responsibilities of the Potential Gas Agency include the following:

a. Approving criteria and methods established by Potential Gas Committee, including protecting the confidentiality of Potential Gas Committee data.
b. Insuring maintenance of the highest scientific standards and objectivity in Potential Gas Committee studies and reports.
c. Reviewing and evaluating reports prepared by the Potential Gas Committee.
d. Publishing, distributing, and publicizing reports of final estimates and other pertinent reports prepared by the Potential Gas Committee so as to assure the widest possible distribution and to promote understanding of them.
e. Further develop mutual understanding among the segments of the gas industry by helping the Gas Supply Committee unite the industry behind the potential gas studies.
f. Help improve industry-government relations in the public interest looking toward maximum acceptance and usefulness of potential gas studies.
g. Fulfill the professional obligation to publish technical papers concerning new techniques and knowledge gained.
h. Appointing chairman and vice chairmen of Potential Gas Committee, with approval of Gas Supply Committee.
i. Approving appointment by Gas Supply Committee of other members, representatives and observers to the Potential Gas Committee.
j. Approving appointment by chairman of Potential Gas Committee of chairman of each Area Work Committee and chairmen of other committees.
k. Conduct the work of the Potential Gas Agency, in the public interests, in a manner which will enhance the stature of the Colorado School of Mines.
l. Adhere to the highest standards of objectivity.

The Colorado School of Mines may pursue other research, and individuals from the Agency may be involved in other research, consulting, and preparation and publication of papers in their professional fields, so long as these activities do not involve a conflict of interest nor invalidate the objectivity of the Agency.

Potential Gas Committee

Membership of the Potential Gas Committee includes the following:

a. Chairman of Potential Gas Committee.
b. Secretary of Potential Gas Committee.
c. Regional vice chairmen.
d. Chairman of each Area Work Committee.

e. Chairman of Executive Committee.
f. Chairman of Editorial Committee.
g. Chairman of Committee on Definitions and Procedures.
h. Chairman of Time and Site Committee.
i. Director of the Potential Gas Agency, ex officio.
j. Observer from the Federal Energy Regulatory Commission.
k. Observers from the Department of Energy.
l. Observer from the Geological Survey, United States Department of the Interior.
m. Observer from the Bureau of Mines, United States Department of the Interior.
n. Observer from National Association of Regulatory Utility Commissioners.
o. Observer from the Interstate Oil Compact Commission.
p. Observer from the Gas Research Institute.
q. Observer from the Institute of Gas Technology.
r. Representative from the natural gas pipeline industry.
s. Representative from the natural gas distribution industry.
t. Observer representing the American Gas Association.
u. Observer from the Canadian natural gas industry and observer from the Mexican natural gas industry.
v. Honorary Technical Advisors.
w. Members-at-large.
x. Representatives and observers from other organizations may be recommended for appointment by the Potential Gas Agency Director and approved by the Gas Supply Committee.

All members of the Potential Gas Committee, except those specifically designated as observers, are considered as voting members of the Potential Gas Committee. Observers are invited and encouraged to participate in discussion of items brought before the Potential Gas Committee but do not have a vote in the determination of policy and procedure. Alternates to representatives and observers may be appointed.

Candidates for committee chairmen and vice chairmen normally will be geologists or persons with geology background from the academic community, pipelines, independent firms, gas utilities or producing companies. Retired or semi-retired gas industry people are not excluded from consideration.

Officers of the Potential Gas Committee and Work Area Committees are appointed as outlined in the Organizational Chart (fig. 48). Normally they serve for a period of one report. They are eligible for reappointment, however, for one additional report period. In calculating eligibility for reappointment, a partial term of office shall not be counted. This policy shall not operate to disqualify a member from longer service by reason of elevation in the organization. In other words, the two-term limitation shall apply to each position held, considering each membership or officership on a work committee or top committee as a separate position.

All officers, regional chairmen, and the pipeline and distributor representatives appointed by the American Gas Association Gas Supply Committee shall be subject to the two-report limit. Exceptions must be recommended by the appropriate Committee Chairman and the Potential Gas Agency Director, and approved by the American Gas Association Gas Supply Committee.

The designation of Honorary Technical Advisor may be given to such persons as have performed exceptional service to the Potential Gas Committee and whose continued participation and advice are desirable for the continued successful operation of the Committee. Honorary Technical Advisors are permanent voting members, and their appointment is recommended by the Executive Committee and approved by the Potential Gas Agency Director and the Gas Supply Committee.

Members-at-large include persons who have special knowledge of the occurrence of natural gas or the natural gas industry, and whose expert advice will contribute to the successful performance of the Committee's assignments. The appointment of members-at-large is approved by the Gas Supply Committee upon recommendation by the Potential Gas Agency Director. Members-at-large are appointed for the preparation of a specific PGC report. Their appointment may be continued indefinitely but is subject to review and approval at the time of organization of the Potential Gas Committee for each succeeding report.

Observers from sponsoring associations, governmental agencies, and other cooperating groups serve at the discretion of these organizations and are not subject to the two-report policy.

The primary duties and responsibilities of the Potential Gas Committee include the following:
a. Outlining the scope and coverage of the estimates of potential natural gas supply.
b. Establishing criteria and methods for estimation of potential natural gas supply and other pertinent studies.
c. Designating Work Areas and Special Projects.
d. Appointing the chairman of each Area Work Committee (by action of chairman of Potential Gas Committee).
e. Approving appointment of other members of each Area Work Committee who are appointed by the chairman of each Area Work Committee (by action of chairman of Potential Gas Committee).

f. Instructing Area Work Committees.
g. Supervising, coordinating, advising, reviewing, evaluating, approving, and compiling estimates and such other assignments as may be given to committees.
h. Preparing reports of final estimates and such other reports as may be pertinent.
i. Submitting reports of final estimates and other pertinent reports to the Potential Gas Agency and counseling with director regarding publication and distribution of such reports.

Area Work Committees

Membership of Area Work Committees includes the following:

a. Chairman of each Area Work Committee.
b. An appropriate number of qualified working members deemed necessary by the chairman of each Work Committee to insure the most objective estimates of potential supply of natural gas in the respective area assigned. Work Committee members are individuals from the natural gas and oil industries and other individuals who are qualified by their knowledge and experience to make estimates of potential supply of natural gas. The individuals are selected for each area because they have a close, working knowledge in all aspects of natural gas exploration and production.
c. At least one qualified representative on each Area Work Committee from the natural gas pipeline industry, appointed by the Gas Supply Committee.
d. At least one qualified representative on each Area Work Committee from the natural gas distribution industry, appointed by the Gas Supply Committee.

The Chairman and Vice Chairman of each Area Work Committee are subject to the two-report limit. Exceptions must be recommended by the Regional Vice Chairman, approved by the Potential Gas Committee Chairman and the Potential Gas Agency Director, and reported to the Gas Supply Committee, and only after receiving a clearance letter from the member's employer.

Other members of the Area Work Committees, appointed by the Area Chairman, will normally participate in the preparation of two successive reports. Service beyond the preparation of two reports may be continued if necessary to maintain adequate expertise and continuity on the Area Work Committee. Continuation of service beyond two reports must be recommended by the Area Chairman and approved by the Regional Vice Chairman, the Potential Gas Committee Chairman, and the Potential Gas Agency Director.

The primary duties and responsibilities of Area Work Committees include the following:

a. Appointing appropriate number of qualified working members to insure proper representation of various sectors of the industry and objectivity for the best estimates of potential supply of natural gas for the assigned areas (by action of chairman of each Area Work Committee).
b. Estimating quantity of potential supply of natural gas in working areas designated by the Potential Gas Committee pursuant to the guidelines and parameters established by the Potential Gas Committee and approved by the Potential Gas Agency, and such other studies as may be assigned by the Potential Gas Committee.
c. Performing such other assignments as may be made in the respective area assigned by the Potential Gas Committee regarding such estimate.

Each member of each Area Work Committee will submit his estimates of potential supply of natural gas and such other assignments as may be given to him in his assigned sub-area to the chairman and other members of his committee for review, evaluation, and approval.

Since the type and quantity of available information upon which to base estimates of potential natural gas supply vary widely from area to area, the Area Work Committee members use varied approaches in making their estimates. Inasmuch as the individual members work with private information obtained on a confidential basis from many sources, their working papers are not revealed in detail to anyone, including other members of the same Area Work Committee or others in the Potential Gas Committee. Without such confidential information the Potential Gas Committee could not perform its task; therefore, each member, observer, or representative of the Work Committees is aware of and must respect the confidential nature of the data made available to him and of the estimates and other assignments prepared or reviewed by the Area Work Committees and the Potential Gas Committee.

STANDING COMMITTEES OF THE POTENTIAL GAS COMMITTEE

Executive Committee

The Executive Committee shall serve as the administrative coordinating committee for the Potential Gas Committee. It shall consider and discuss any matters of policy which are brought to its attention and shall make recommendations to the Potential Gas Committee regarding changes in policy. It shall act in behalf of the Potential Gas Committee on matters of urgency which arise between regularly scheduled meetings of the Potential Gas Committee. It may also be empowered to act on behalf of the Potential Gas Committee on matters designated by the Potential Gas Committee. At such times as vacancies occur in the following offices, the Executive Committee shall either act as a nominating committee to recommend suitable candidates or appoint a nominating committee from among its membership: PGC Chairman, Regional Vice Chairmen, Secretary of the PGC, and Chairman of the Executive Committee. Chairmen of PGC standing committees, with the exception of the Executive Committee, will be appointed by the PGC Chairman, subject to approval by the Executive Committee. All actions of the Executive Committee will be reported to the membership of the Potential Gas Committee at their next regularly scheduled meeting, and shall be subject to review and approval by the Potential Gas Committee.

Membership

Chairman, elected from the membership of the Potential Gas Committee by the voting members of the PGC at a regular meeting. Nominations for Chairman will be made by the Executive Committee and nominations will also be received from the floor. Normally, the Chairman will be elected at the fall meeting following publication of the biennial PGC report and will serve for two years. Vacancies will be filled by election at the next regular PGC meeting, following the same procedure, and a Chairman so elected will serve for the remainder of the unexpired term. In the absence of the elected Chairman, the Chairman of the Potential Gas Committee will serve as Chairman of the Executive Committee.

The following ex officio voting members: PGC Chairman, PGC Regional Vice Chairmen, Secretary of the PGC, Potential Gas Agency Director, Chairmen of Standing Committees, representatives appointed to the PGC from the natural-gas pipeline and natural-gas distribution industries, representative from the Canadian gas industry, observer from the American Gas Association.

In addition, a maximum of 5 voting members-at-large may be appointed by the Potential Gas Committee Chairman, subject to approval by the Potential Gas Agency Director.

Editorial Committee

The Editorial Committee will review and approve the editorial content and format of PGC reports. They will work closely with the Potential Gas Agency in the publication of all official publications of the Potential Gas Committee.

Membership

Chairman, appointed by the Potential Gas Committee Chairman, and approved by the Executive Committee. Four members of the Potential Gas Committee, appointed by the Editorial Committee Chairman, with approval of the PGC Chairman. PGC Chairman, ex officio; Potential Gas Agency Director, ex officio.

Committee on Definitions and Procedures

This Committee has the responsibility of reviewing and recommending to the membership of the Potential Gas Committee any proposed changes in the definitions and procedures used in the estimation of potential gas resources. Proposals to be reviewed by this Committee may be submitted by any member of the Potential Gas Committee. The Committee will further review estimates of potential gas resources made by other organizations which come to the attention of the Committee and may, from time to time, as deemed appropriate, prepare publications dealing with the comparison of the work of the Potential Gas Committee with that of other organizations. The Committee on Definitions and Procedures will also serve as liaison with the U.S. Geological Survey Resource Appraisal Group and other such organizations as are involved in the work of estimation of potential gas resources.

Membership

Chairman, appointed by the PGC Chairman, and approved by the Executive Committee. Four members of the Potential Gas Committee, appointed by the Chairman of the Committee on Definitions and Procedures, with approval of the PGC Chairman. PGC Chairman, ex officio; PGA Director, ex officio.

Time and Site Committee

This Committee will select an appropriate location and date for each national PGC meeting which will serve best the needs of the Committee. Once the site and date of each meeting have been selected by the Committee, the Potential Gas Agency will be charged with the responsibility of completing the arrangements for the meeting. The Time and Site Committee will also coordinate any regional meetings which are scheduled by Regional Vice Chairmen in order that the dates of such meetings shall not be in conflict.

Membership

Chairman, appointed by the PGC Chairman, and approved by the Executive Committee. Two members of the Potential Gas Committee, appointed by the Chairman of the Time and Site Committee, and approved by the PGC Chairman. Regional Vice Chairmen, ex officio; PGC Chairman, ex officio; PGA Director, ex officio.

COMMUNICATIONS

Communication Between Committees

The formal channel of communication shall be from the Area Work Committees to the Potential Gas Committee to the Potential Gas Agency to the American Gas Association Gas Supply Committee and vice versa.

Public Communication

Members of the Potential Gas Agency, the Potential Gas Committee, and the Area Work Committees are encouraged to publicize and explain their work. These efforts should be limited to explaining the methodology used, comparative methodology, and the strengths and limitations of the work. When acting as spokesmen for the Committee, members shall refrain from interpreting study results in terms of national policy needs or required industry incentives. Members who are called upon to make talks and write papers on behalf of the Committee should submit texts to the Potential Gas Agency for comment and policy review.

MEMBERSHIP OF THE POTENTIAL GAS AGENCY AND POTENTIAL GAS COMMITTEE

POTENTIAL GAS AGENCY

Harry C. Kent, Director
James C. Donaldson, Assistant to the Director
Ladine Rintoul, Administrative Assistant

POTENTIAL GAS COMMITTEE

George C. Grow, Jr., Chairman
Charles J. Crowley, Vice Chairman, Western Region
James K. Curry, Vice Chairman, Central Region
Robert W. Gallagher, Vice Chairman, Eastern Region
Merlin A. Johnson, Secretary

Executive Committee

E. Floyd Humphries, Chairman

Charles M. Allen
A. M. Derrick
Jimmie C. Herrington
Richard J. Murdy
E. A. Rassinier

ex officio:
Donald W. Axford
Richard J. Burgess
Robert J. Cordell
Charles J. Crowley
James K. Curry
Robert W. Gallagher
George C. Grow, Jr.
Merlin A. Johnson
Robert B. Kalisch
Harry C. Kent
Charles P. Moreton
Charles L. Neumeyer
A. A. Wilkins (alt.)

Editorial Committee

Charles L. Neumeyer, Chairman

Charles J. Crowley
A. M. Derrick
E. Floyd Humphries
E.A. Rassinier

ex officio:
George C. Grow, Jr.
Harry C. Kent

Committee on Definitions and Procedures

Robert J. Cordell, Chairman

Richard J. Burgess
Donald E. Hallinger
Jimmie C. Herrington
David A. Rochester

ex officio:
George C. Grow, Jr.
Harry C. Kent

Time and Site Committee

Richard J. Burgess, Chairman

Jimmie C. Herrington
ex officio:
Charles J. Crowley
James K. Curry

Robert W. Gallagher
George C. Grow, Jr.
Harry C. Kent

Area Work Committees

Area	*Chairman*	*Vice Chairman*
A	E. Perry Bendler	Porter J. Brown
B	Billy C. Cook	John M. Richart
C	William E. Mantek	John Avila
D	Paul Mounce	Billy D. Brown
E	Charles R. Brammell	—
G	Jeffery V. Morris	Bill C. Burkman
H	James A. Barlow, Jr.	C. Keith Fisher
I	Robert D. Habbit	—
J-N	Alan F. Chatfield	Joe E. McGarrah
J-S	Charles M. Allen	James F. Fleming
K	Alexander Sisson	—
L	William F. Edmondson	Wesley E. Franklin

Observers

Donald W. Axford, D. W. Axford & Associates Ltd. (Canada)
Lucio A. D'Andrea, Energy Resources Development (DOE)
Gordon L. Dolton, U.S. Geological Survey
W. Timothy Dowd, Interstate Oil Compact Commission
E. Bruce Hagen, National Assn. of Regulatory Utility Commissioners
Tommie C. Hillis, Federal Energy Regulatory Commission (alternate)
Robert B. Kalisch, American Gas Association
Gordon W. Koelling, Energy Information Administration (DOE)
B. J. Moore, U.S. Bureau of Mines
J. Glenn Seay, Institute of Gas Technology
John C. Sharer, Gas Research Institute
Wayne M. Thompson, Federal Energy Regulatory Commission
A. A. Wilkins, TransCanada PipeLines (Canada, alternate)

Representatives

Charles L. Neumeyer — Gas Distributors
Charles P. Moreton — Pipelines

Honorary Technical Advisors

Charles M. Allen
B. Warren Beebe
Mark V. Burlingame
John M. Hanley
Richard J. Murdy
E. A. Rassinier
Lyon F. Terry

Members-at-Large

Francis J. Barker
A. M. Derrick
John D. Haun
Jimmie C. Herrington
Michael J. Popovich
Charles E. Smith
Franklin D. Stockman
Gordon K. Zareski

ALLEN, C.M. (8)[+]: Consultant, Expl. & Prod. Affairs — Industry & Govt., No. Am. Expl. & Prod. Div., Phillips Petrol. Co., Bartlesville, OK 1944-. Adv. Board to Dept. of Geol., Univ. KS 1973-. Mem. Am. Assn. Petrol. Geol. (Comm. on Statistics of Drlg.). Nat. Petrol. Council (Comm. on Emergency Preparedness, 1974-76, Comm. on U.S. Energy Outlook 1970-73), Fed. Power Comm. Natl. Gas Surv. (Gas Supply Task Force 1971-75). Has testified in numerous state conservation agency, state and federal courts, and Fed. Power Comm. proceedings (including all major area and national rate proceedings), and hearings before Senate and House Congressional Committees. (Honorary Technical Advisor.)

AXFORD, Donald W. (6): Pres., D.W.Axford & Associates, Consulting, Calgary, Canada 1978-. Director: Frio Oils Ltd., Strand Oil & Gas Ltd.; Rock Ore Mining. DB&K Oils Ltd., Pres. 1977-78. Petro-Canada Inc., Sr. V. Pres. Expl & Dir.; Pan Arctic Oils Ltd., Dir. 1976-77. Mobil Oil Canada, V. Pres., Expl. & Dir. (Calgary) 1948-76. Mem. Am. Assn. Petrol. Geol. (Adv. Council, Energy Minerals Div. Tar Sands Councilor), Canadian Petrol. Geol., Geol. Assn. Canada, Prof. Engr. Alberta, Soc. Econ. Paleon. & Min. (CANADA — Chairman.)

BARKER, Francis J. (4): V. Pres., Nat. Gas & Gas Liquids Dept., Oil & Gas Div., Union Oil Co. of CA, Los Angeles, CA 1971-; Gen. Mgr. (Chicago) 1970-71; Mgr. Opr. (Midland) 1967-70; Mgr. Engr. (Thums-Long Beach Co.) 1965-67; Dist. Mgr. (Santa Maria) 1963-65; Mgr. Expl. (Canary Islands, Spain) 1960-63; Supt. (Coalinga) 1957-60; Engr. 1948. Mem. Am. Petrol. Inst., Am. Inst. Min. Engr., Am. Assn. Petrol. Geol., Gas Processors Assn. (Board of Dir.), Am. Gas Assn. (Steering Comm., Gas Supply).

BEEBE, B.W. (8): Geol., Geophysicist & Energy Consultant, Laguna Hills, CA 1980-, Geol., Geophysicist & Energy Consultant (Boulder, CO) 1972-80. Millison & Beebe (Partner) 1969-72. M. M. & B., Inc., V. Pres. & Sec., 1964-72. Ind. Geol. and Geophysicist 1959-64. Keating Drlg. Co., V. Pres. and Dir. 1955-58. Manhart, Millison & Beebe (Partner) 1950-55. Anderson-Prichard Oil Corp., Expl. Mgr. 1947-50. Bay Petrol. Corp., Ch. Geol., Expl. Mgr. (organized expl. dept.); V. Pres. 1942-47. Lerke & Whortan, Assoc. Cons., 1939-41. British-American Oil Prod. Co., Div. Geol. 1938-39. Shell Petrol. Corp., Geol. and Asst. to V. Pres. Expl., 1935-38. KS Emergency Relief Comm., Geol. 1934. Mem. Am. Assn. Advancement Science (Fellow), Geol. Soc. Am. (Fellow), Am. Assn. Petrol. Geol. (Hon. mem.), OK Geol. Soc. (Hon. mem.), Rocky Mtn. Assn. Geol. (Hon. mem.), Am. Arbitration Assn., Am. Gas Assn., Assn. Prof. Geol. Scientists, KS Geol. Soc., Oklahoma City Geol. Soc., Soc. Expl. Geophysicists, Soc. Ind. Prof. Earth Scientists, Soc. Petrol. Engr., Rocky Mtn. Nat. Gas Men's Assn. (Honorary Technical Advisor.)

BURGESS, Richard J. (6): Exec. V. Pres., Northern MI Expl. Co., Jackson, MI 1980-; V. Pres. 1967-80. Consumers Power Co., Exec. Dir. Expl. 1967-80; Expl. Supv. 1963-67. Panhandle Eastern Pipe Line Co., Geol. 1962. Plymouth Oil Co., Geol. 1960-61. Imperial Oil Ltd. (Canada), Geol. 1954-60. Mem. Am. Assn. Petrol. Geol. (CPG #462), Geol. Soc. Am., MI O&G Assn., MI Basin Geol. Soc., Ontario Petrol. Inst.

BURLINGAME, Mark V. (8): Burlingame Consultants, Bradenton, FL 1967-. Nat. Gas Pipeline Co. of Am., Planning, Construction & Opr. Pipeline System, Offshore and Onshore Expl. Programs, Gas Storage in Aquifers fms. (dev.), Sr. V. Pres. Opr. (ret.) 1930-67. Served the Dept. of Interior as natural gas operations consultant and as the U.S. representative observer to the United Nation's European Economic Committee's Gas Energy Committee, served on technical natural gas missions behind the Iron Curtain. Mem. Am. Assn. Petrol. Geol. (Cert.), Am. Gas Assn., Am. Geol. Inst., Assn. Ind. Pet. Geol., Am. Pet. Inst., So. Gas Assn. (Honorary Technical Advisor.)

CORDELL, Robert J. (3): Consultant, Cordell Reports Inc., Richardson, TX 1980-; Consultant (Dallas, TX) 1977-80. Suntech Inc., Sr. Prof. Scientist, Energy Tech. and Sciences Dept., Res. and Engr. Div. (Richardson, TX) 1975-77. Sun Oil Co., Research Scientist, Sr. Research Scientist 1970-75; Sr. Sec. Mgr., Geol. Research 1963-70; Mgr. Geol. Research 1955-63; Research Paleontologist-Research Geol.-Sr. Research Geol. 1951-55. Mem. Am. Assn. Adv. Sci. (Fellow), Am. Assn. Petrol. Geol., Dallas Geol. Soc. (Hon. Life Mem.), Dallas Geophys. Soc., Geol. Soc. Am. (Fellow), Paleon. Soc., Soc. Paleon. and Mineralogists.

CROWLEY, Charles J. (4): Consulting Reservoir Geol., El Paso Natural Gas Co., El Paso, TX 1977-; Sr. Reservoir Geol. 1965-77. Hercules Powder Co., Supv. 1962-65. Consultant (WY & AZ) 1958-62. Forest Oil Corp., Area Geol. 1953-59. Marathon Oil Co. (OH Oil), Scout-Area Geol. (Billings and Casper) 1949-53. Mem. Am. Assn. Petrol. Geol., El Paso Geol. Soc., Soc. Mining Engr., Reg. Geol. (AZ).

CURRY, James K. (8): Mgr., Rocky Mtn. Region, Panhandle Eastern Pipe Line Co., Denver, CO 1975-; Mgr. Expl. & Prod. (Pan Eastern Expl., Houston) 1973-75-; Mgr. Expl., Mgr. Geol., Dist. Geol., Geol., Jr. Geol. (Liberal, KS) 1946-72. Mem. Am. Assn. Petrol. Geol., Soc. Petrol. Engr., Rocky Mtn. Assn. Geol., Rocky Mtn. Nat. Gas Men's Assn., Assn. Prof. Geol. Scientists (Cert. #4353).

D'ANDREA, Lucio A. (4): Chief, Nat. Gas Div., Office of Oil & Gas, Energy Resource Development, U.S. Dept. of Energy, Washington, D.C. Experience of about 20 years in various aspects and activities of natural gas industry — production, transportation, distribution and alternate gas supplies. Mem. Soc. Petrol. Engr., Soc. Military Engr.

DERRICK, A.M. (8): Sr. V. Pres., Marketing, Rates, Regulatory Affairs, Customer Relations, El Paso Natural Gas Co., El Paso, TX 1977-; V. Pres. 1972-77; Asst. V. Pres. 1966-71; Dir., Reservoir Engr. 1960-65; Asst. Mgr., Reservoir Engr. 1958-60; Sr. Petrol. Engr.-Reservoir Engr. 1953-57. Stanolind Oil & Gas Co., Petrol. Reservoir Engr. 1947-53. Mem. Am. Assn. Petrol. Geol., Soc. Petrol. Engr., Soc. Petrol. Eval. Engr., Nat. Gas Mens' Assn.

DOLTON, Gordon L. (3): Proj. Chief, Resource Assessment Group-Domestic, Br. Oil and Gas Resources, U.S. Geological Survey, Denver, CO 1975-; Geol., Resource Appraisal

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[+] Number in parentheses following name indicates number of Potential Gas Committee reports in which member participated.

Group 1974-75. Shell Oil Co., Staff Geol. (Houston) 1973-74; Staff head, Planning and Venture Development (Denver) 1963-66; Sr. Geol. (Okla. City) 1963-66; Geol. (WY) 1954-60. Shell Development Co., Research Geol. (Houston) 1960-63. Richfield Oil Corp., Geol. 1951-52. Mem. Am. Assn. Petrol. Geol., Geol. Soc. Am., Rocky Mtn. Assn. Geol.

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GALLAGHER, Robert W. (5): Mgr., Reserves and Deliverability, Southern Natural Gas Co., Houston, TX 1967-; Sr. Engr. 1962-67. Mem. Am. Assn. Petrol. Geol.

GROW, George C. Jr. (8): Consulting Geol., Westfield, NJ 1974-. Transcontinental Gas Pipe Line Corp., Ch. Geol.-Eastern area (NJ) 1950-73. The Peoples Natural Gas Co., Jr. Geol. to Ch. Geol. (PA) 1939-50. Standard Oil Co. (NJ), Geol. (Venezuela) 1938-39. Mem. Am. Assn. Petrol. Geol. (Cert. #31, Treas. 1974-76, Adv. Council 1976-, Fndn. Dev. Coord. 1973-), Am. Inst. Min., Met. & Petrol. Engr., Assn. Prof. Geol. Scientists (Cert. #1774), Geol. Soc. Am. (Fellow), Pittsburgh Geol. Soc. (Past Pres.), Am. Gas Assn. (Comm. Underground Storage 1951-73, Chmn. 1960-61; Task Group on Gas Storage Statistics, Chmn. 1964-71), Am. Petrol. Inst., PA Oil & Gas Assn., Ind. Oil & Gas Assn. WV, Lamont-Doherty Geol. Observatory, Columbia Univ. (Adv. Council), Fed. Power Comm. Natl. Gas Surv. (Underground Storage Task Force 1972-73; Prospective Expl. & Development Task Force 1975-).

HAGEN, E. Bruce (2): Commissioner, North Dakota Public Service Commission, Bismarck, ND 1961-. Deputy Motor Vehicle Registrar for North Dakota 1961. Farmer in Benson and Ramsey Counties in North Dakota 1956-. Mem. Mid-America Regulatory Comm., Natl. Assn. Reg. Util. Comm., Regional Energy Adv. Bd of U.S. Dept. of Energy, Regulatory Council.

HALLINGER, Donald E. (7): Mgr. Expl., Pacific Lighting Gas Development Co., Los Angeles, CA 1977-; Sr. Geol. 1966-77. Mem. Am. Assn. Petrol. Geol. (Cert.), Assn. Prof. Geol. Scientists (Cert., Past Sec.-Treas.), Soc. Econ. Paleon. & Min.

HANLEY, John M. (6): Retired, Omaha, NB 1973-. Northern Nat. Gas Co., V. Pres.-Gas Supply Studies 1965-73; V. Pres.-Long Range Planning 1963-65; V. Pres.-Gas Supply 1950-63; Supt. Prod./Head Dept. 1942-50; Prod. Engr. 1936-42; Gas Field Supt. (KS) 1933-36. Mem. Am. Assn. Petrol. Geol., Soc. Petrol. Engr., Am. Gas Assn. (Nat. Gas Reserves Comm. 1945-56; Chmn., Nat. Gas Prod. Comm. 1956), Natl. Petrol. Council (Comm. on U.S. Energy Outlook 1970-72), Fed. Power Comm. (Natl. Gas Surv., Gas Supply Task Force 1970-73), Adv. Comm. on Energy to Sec. Int. 1970-71.

HAUN, John D. (7): Prof. Petrol. Geol., Colorado School of Mines, Golden, CO 1955-. Barlow and Haun, Inc., Consultant 1957-. Petroleum Research Corp., V. Pres. 1952-57. Stanolind (Amoco), Geol. Party Ch. 1951-52. Mem. Am. Assn. Petrol. Geol. (Pres 1979-80), Am. Geol. Inst. (Pres. 1981-82), Am. Inst. Prof. Geol. (Pres. 1976), Am. Petrol. Inst., Geochem. Soc., Geol. Soc. Am. (Fellow), Nat. Petrol. Council, Rocky Mtn. Assn. Geol. (Pres. 1968), Soc. Econ. Paleon. & Min.

HERRINGTON, J.C. (6): Mgr., Atlantic OCS Proj., ARCO Oil and Gas Co., Dallas, TX 1980-; Mgr., CO^2 Expl., Western Reg. 1978-80; Mgr., Expl. Permian Dist. (Midland, TX) 1973-78; Spec. Proj. & Dist. Geol. (Lafayette, LA) 1971-73; Dist. Geol. (Tyler, TX) 1962-71; Dist. Geol. (offshore LA) 1959-62; Area Geol. (Dallas) 1959; Geol. & Sr. Geol. (So. LA) 1953-58; Oil Scout (MS-AL) 1952-53. Mem. Am. Assn. Petrol. Geol., W. TX Geol. Soc., Am. Gas Assn., Am. Petrol. Inst., NM Geol. Soc., Assn. Prof. Geol. Scientists, Dallas Geol. Soc., Rocky Mtn. Assn. Geol.

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JOHNSON, Merlin A. (5): Mgr.-Northeast Dist., ANR Production Co., Troy, MI, 1980-; American Natural Gas Production Co., Detroit, MI 1978-80; Michigan Natural Resources, V. Pres. Opr., MI Basin 1976-78; Michigan Consolidated Gas Co., Dir., Geol., Expl. & Gas Acquisition 1964-78; Mgr. Geol. Dept. (Grand Rapids, MI) 1959-64. Gulf Oil Corp., Zone Geol. & Staff Asst. Explor. Mgr., MI, IL & Andarko Basins 1949-59. Mem. Am. Assn. Petrol. Geol., Assn. Prof. Geol. Sci., MI Basin Geol. Soc., Engr. Soc. Detroit.

KALISCH, Robert B. (3): Director, Gas Supply and Statistics, American Gas Association, Arlington, VA 1975-. U.S. Air Force assignments (including Off. Scientific Research, Science and Tech. Staff Officer and Dir., Ionospheric Physics Lab.) 1951-75. Mem. Inst. Elec. and Electronics Engr., Research Soc. Am., Prof. Engr. (MA).

KENT, Harry C. (3): Director, Potential Gas Agency, Colorado School of Mines, Golden, CO 1976-; Prof. Geol. 1969-, Head, Geol. Dept. 1970-75, Act. Head, Geol. Dept. 1969-70, Assoc. Prof. Geol. 1967-69, Asst. Prof. Geol. 1964-67, Instructor Geol. 1956-64. The California Co., Geologist (FL & LA) 1953-56. Stanford Univ., Teaching Asst. 1953. Mem. Am. Assn. Adv. Sci., Am. Assn. Petrol. Geol., Geol. Soc. Am. (Fellow), Rocky Mtn. Assn. Geol. (Ed., Colorado Geology 1978-80), Soc. Econ. Paleon. & Min.

KOELLING, Gordon W. (2): Sr. Specialist, Br. Natural Gas Statistics, Energy Information Adm. (DOE), Washington, DC 1977-. U.S. Bureau Mines, Washington, DC 1957-77. Corps of Engr. 1951-57.

MOORE, Billy J. (3): Chief, Unit of Helium Resources Evaluation, Division of Helium Operations, U.S. Bureau of Mines, Amarillo, TX 1961-. U.S. Air Force 1958-61. Phillips Petrol. Co., Jr. Engr. (McGregor, TX) 1957-58. Mem. Reg. Prof. Engr. (TX).

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ROCHESTER, David A. (5): The Fuels Planning Engineer, Public Service Elec. & Gas Co., Newark, NJ 1977-; The Natural Gas Engr. 1971-77; Engr. 1966-71. Mem. Assoc. Gas Distr. (Vice Ch.-Oper. Comm. & Ch. Computer Modeling Comm.), Am. Gas Assn., NJ Gas Assn., Soc. Petrol. Engr., Petrol. Expl. Soc. of NY, Am. Inst. Min., Met. & Petrol. Engr. Assn.

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STOCKMAN, Franklin D. (2): V. Pres. & Asst. to Exec. V. Pres., Northern Natural Gas Co., Omaha, NB 1980-; V. Pres. & Asst. to Pres., Natural Gas Group 1977-80; V. Pres.-Gas Supply 1965-77; Dir. Gas Reserves & Availability 1958-65; Staff Asst. & Chief of Services-Reserves & Availability 1956-58. Phillips Petroleum Co., Supr. Engr. Statistics 1944-56. Mem. Am. Assn. Petrol. Geol., Am. Gas Assn., Soc. Petrol. Engr., Interstate Nat. Gas Assn. Am., So. Gas Assn.

TERRY, Lyon F. (8): Ret., Ridgewood, NJ 1967-. Lehman Bros., Assoc. 1957-66; Chase Nat. Bank, V. Pres. & Gas Engr. 1937-57; Ralph E. Davis Engr. (NYC), V. Pres. 1927-37; ESSO (NJ), Gas Eval. Engr. 1925-27; O&G Engr. (OK) 1915-25. Mem. Soc. Petrol. Engr., Am. Gas Assn. (Nat. Gas Reserves Comm., organized and Chmn. 1944). (PGC organizer, first Chmn., and Hon. Tech. Adv.)

THOMPSON, Wayne M. (1): Chief, Gas Supply Branch, Office of Pipeline & Producer Regulation, Fed. Energy Regulatory Comm., Washington, DC 1967-. Geol. Consultant (Oil & Gas) (El Dorado, AR) 1961-67. Robbins Petrol. Corp., Geol.-Engr. (Longview, TX) 1959-1961. Petroleum, Inc., Geol. (Shreveport, LA) 1958-59. McAlester Fuel Co. (Magnolia, AR) 1954-58

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ZARESKI, Gordon K. (1): Sr. V. Pres., H. Zinder & Assoc., Washington, DC 1979-. Department of Energy, Office of the Oil & Gas Information System, Director (Washington) 1977-79. Federal Power Comm., Bureau of Natl. Gas, Chief of Planning & Development (Washington) 1969-77. Mem. Am. Assn. Petrol. Geol., Geol. Soc. Washington, DC.

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Porter J. Brown, Vice Chairman

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BENNETT, William E. (8): Pres., Phoenix Hydrocarbon, Ltd., Charleston, WV 1979-; Pres. GASAMEX, Ltd., Pres. (Charleston, WV) 1977-and V. Pres.-Expl., Monitor Petrol. Corp., (NYC/Charleston, WV) 1976-; Geol./Geophysicist 1974-76. Monitor Resources Corp., NYC, Cons. 1976-. Lunsford Granite Materials, Elberton, GA, V. Pres. 1976-. United Fuel Gas Co., Sr. Geophysicist 1969-74, Geophysicist 1962-68, Geol. 1957-61. Mem. Am. Assn. Petrol. Geol., Assn. Prof. Geol. Scientists (Cert. #1642, Past Pres. WV Sec.), Soc. Expl. Geophysics, Ind. O&G Assn. WV, OH Geol. Soc., Appalachian Geol. Soc., Fed. Power Comm. Natl. Gas Surv. (Tech. Adv. 1975-76), Am. Gas Assn. (Atl. Action Comm. 1974-75).

*BROWN, Porter J. (3): Chief-Geol. Serv., Columbia Gas Trans. Corp., Charleston, WV 1973-. United Fuel Gas Co., Ch. Geol. 1960-73, Geol. 1957-60, Asst. Geol. 1950-57. Mem. Am. Assn. Petrol. Geol., Geol. Soc. Am., Appalachian Geol. Soc., Geol. Soc. KY, Geol. Soc. OH, Geol. Soc. PA, Assn. Prof. Geol. Scientists (Cert. #2463), Gas Res. Inst. Indus. Tech. Adv. Comm. (Unconventional Nat. Gas), Prof. Petrol. Engr. (KY #4927), Prof. O&G Engr. (WV #5118).

FREUND, Paul G. (8): Ch. Geol., The Peoples Nat. Gas Co., Pittsburgh, PA 1952-. State of PA, Engr. 1950-52. Mem. Am. Assn. Petrol. Geol., Am. Gas Assn., Pittsburgh Geol. Soc (Past Pres.).

GROW, George C. Jr. (8): Consulting Geol., Westfield, NJ 1974-. Transcontinental Gas Pipe Line Corp., Ch. Geol.-Eastern Area (NJ) 1950-73; The Peoples Natural Gas Co., Jr. Geol. to Ch. Geol. (PA) 1939-50; Standard Oil Co. (NJ), Geol. (Venezuela) 1938-39. Mem. Am. Assn. Petrol. Geol. (Cert. #31, Treas. 1974-76, Adv. Council 1976-, Fndn. Dev. Coord. 1973-), Am. Inst. Min., Met. & Petrol. Engr., Assn. Prof. Geol. Scientists (Cert. #1774), Geol. Soc. Am. (Fellow), Pittsburgh Geol. Soc. (Past Pres.), Am. Gas Assn. (Comm. Underground Storage 1951-73, Chmn. 1960-61; Task Group on Gas Storage Statistics, Chmn. 1964-71), Am. Petrol. Inst., PA Gas Assn., Lamont-Doherty Geol. Observatory, Columbia Univ. (Adv. Council), Fed. Power Comm. Nat'l. Gas Surv. (Underground Storage Task Force 1972-73; Prospective Expl. & Development Task Force 1975-).

HEATHCOTE, Clifton J. (6): Mgr., Gas Procurement, Consolidated Gas Supply Corp., Clarksburg, WV 1975-; Ch. Geol. 1965-75. NY State Nat. Gas Corp., Chief Geol. 1955-65. International Petrol., Field Geol. (Bogota, SA) 1953-55. Peoples Nat. Gas Co., Geol. (Pittsburgh) 1950-53. Mem. Am. Assn. Petrol. Geol., Am. Petrol. Inst., Am. Gas Assn., Pittsburgh Geol. Soc., Appalachian Geol. Soc. (PGC Sec. 1972-77).

LEEPER, Wayne S. (2): Chief Geol. & Mgr., Expl., National Fuel Gas Supply Corp., Buffalo, NY 1974-. United Natural Gas Co. & The Sylvania Corp., Chief Geol. (Oil City, PA) 1969-74; Geol. 1961-69. Mem. Am. Assn. Petrol. Geol., Northern Appalachian Geol. Soc. (Pres. 1965-66), Am. Petrol. Inst. (Penn York Chapter), PA Oil, Gas & Min. Assn. (Bd. Dir. 1976-), Cert. Prof. Geol. Scient. (No. 4308).

**MEHRING, Edmund K. (2): Exec. V. Pres. & Ch. Oper. Officer, Fuel Resources, Inc. (B.U.G. Subsid.), Brooklyn, NY 1980-; V. Pres. 1977-80; Mgr. Exploration 1977-; Mgr. Spec. Proj. 1976-77; Mgr. Tech. Serv. Dept. 1968-76; Asst. Engr. Manuf. 1964-68; Gen. Supt. Greenpoint Plant 1963-64; Supt. Dist. Dept. 1961-63; Supt. Holder Dist. 1958-61; Asst. Supt. 1951-58; Asst. to Supt. 1948-51; Jr. Engr. 1946-48. Mem. Am. Gas Assn. (Mem. Expl. Com. and First V. Chmn.), Assn. Gas Distr., Nat. Assn. Corr. Engr., Soc. Adv. Mgmt., Yale Engr. Assn.

NEWSOM, Max (1): Exploration Advisor, Gulf Oil Expl. & Prod. Co., New Orleans, LA 1949-. Mem. Am. Assn. Petrol. Geol., New Orleans Geol. Soc., Southeastern Geophys. Soc.

RAGSDALE, Tommie R. (3): Ch. Geol., Ray Resources, Charleston, WV 1973-. Consolidated Gas Supply Corp., Development Geol. (Clarksburg) 1966-73; McCullough Tool Co., Engr. Geol. 1962-66. Mem. Appalachian Geol. Soc. (Past V. Pres.).

SHERMAN, Carl W. (7): Assoc. Prof. Petrol. & Nat. Gas Engr., PA State Univ., Univ. Park, PA 1975-. Honeoye Storage Corp., Mgr. Opr. 1974-75; NY State Public Serv. Comm., Principal Systems Planner, Gas Division 1971-74; NY State Div. Min. Resources, Director 1964-71; IL Geol. Surv., Head Petrol. Engr. Sec. 1957-64; J B & M Inc., Tex-Canadian Oil Corp., Marathon. The California Co. 1948-57. Mem. Am. Gas Assn., Am. Petrol. Inst., Soc. Petrol. Engr., Fed. Power Comm. Tech. Adv. Comm. (Natl. Gas Surv.), Interstate Oil Compact Comm. 1957-74.

WIGAL, James M. (2): Geol., Peoples Nat. Gas Co., Pittsburgh, PA 1975-. U.S. Bureau of Mines (DOE), Geol. (Morgantown, WV) 1974-75. Mem. Am. Assn. Petrol. Geol., Soc. Econ. Paleon. & Min., Assn. Prof. Geol. Sci., Pittsburgh Geol. Soc.

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AREA C

William E. Mantek, Chairman
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AVILA, John (7): Expl. Geol., Ashland Exploration, Inc., Ashland, KY 1963-. Ryan Oil Co., Expl. Geol. & Ch. Geol. (Evansville) 1951-63. National Geophysical Co., Inc., Computer (Dallas) 1951-63. Mem. Am. Assn. Petrol. Geol., Soc. Expl. Geophysicists, IN Acad. Science, IN-KY Geol. Soc., Appalachian Geol. Soc. (Pres.), KY O&G Assn. (Dir. & Tech. Chmn.)

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HOWARD, Richard H. (2): Geol., Head of Oil & Gas Sec., IL State Geol. Surv., Urbana, IL 1958-. Phillips Petrol. Co., Geol. 1957-58. U.S. Geol. Survey, CO Plateau Uranium Exploration Project, Geol. 1954-57. Mem. Am. Assn. Petrol. Geol., Soc. Petrol. Engr., Am. Inst. Min., Met. & Petrol. Engr., IL Geol. Soc.

KELLER, Stanley J. (2): Geol., Petroleum Section, IN Geol. Survey, Bloomington, IN 1953-. Mem. Am. Petrol. Ins., IN-KY Geol. Soc., IN Geol.

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MEFFORD, Nace F. Jr. (7): Exec. V. Pres., Enterprise Petroleum, Houston, TX 1979-. Patrick Petroleum Corp., V. Pres. & Mgr. Property Acquisition 1973-79; Div. Mgr. (OK, Rocky Mtn., N. TX) 1970-73. Ashland Oil, Mgr. Property Acquisition 1967-69; Div. Mgr. (OH, MI, Canada) 1964-67; Chief Petrol. Engr. 1953-64; Field Geol. & Engr. (MI basin) 1948-53. Mem. Soc. Petrol. Engr. of Am. Inst. Min. Met. & Petrol. Engr., Soc. Petrol. Eval. Engr.

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Billy D. Brown, Vice Chairman

BROWN, Billy D. (1): Sr. Staff Petrol. Engr., Lone Star Gas Co., Dallas, TX 1974-. Eppler, Guerin & Turner, Acct. Exec. 1967-74. Cornell Oil Co., Petrol. Engr. 1966-67. Texas Pacific Oil Co., Staff Petrol. Engr. 1962-66. Texas Pacific Coal & Oil Co., Petrol. Engr. 1953-62. Mem. Nat. Gas Soc. No. TX, Soc. Petrol. Engr. of Am. Inst. Min. Met. & Petrol. Engr.

BURGESS, Ferrell L. (7): Dist. Mgr., Pennzoil Prod. Co., Shreveport, LA 1980-; Domestic Region Exploitations Mgr. (Houston) 1978-80; Sr. Geol. 1975-78; Dist. Res. Dev. Mgr. 1970-74; Geol. 1967-69. Union Prod. Co., Geol. 1955-67. Mem. Am. Assn. Petrol. Geol., Am. Petrol. Inst., Shreveport Geol. Soc.

**BOYINGTON, Lowell D. (2): Prod. Engr., Arkansas Western Gas Co., Fayetteville, AR 1967-. Texaco Inc., Area Engr. (Kermit, TX) 1962-67. Mem. Reg. Petrol. Engr. AR, Soc. of Petrol. Engrs., Am. Inst. Min., Met. & Petrol. Engr.

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FEEMSTER, Lee T. Jr. (7): Geol. Consultant, Abilene, TX 1974-. Texas Pacific Oil Co., Expl. Geol. & Development Geol. 1955-74. Stanolind (Amoco), Expl. Geol. 1951-55. Mem. Am. Assn. Petrol. Geol., Abilene Geol. Soc., West Texas Geol. Soc.

MOUNCE, Paul (7): Expl. Mgr., Petroxel Resources Inc., Dallas, TX 1980-. Ind. Petrol. Geol. 1978-80. Maynard Oil Co., Ch. Geol. 1974-78. Lone Star Gas Co., Staff & Corporate Development. Texas Pacific Oil Co., Dist. Geol. Fifteen Oil Co., Dist. Geol. Warren Petrol. Corp., Dist. Geol. Mem. Am. Assn. Petrol. Geol., Am. Inst. Min., Met. & Petrol. Engr.

*RICHARDS, G.L. (Jack) (3): Ch. Geol., V. Pres. Expl., Sr. V. Pres. Expl. & Prod., Coastal States Gas Corp., Houston, TX 1964-. Std. Oil Co. TX (Chevron), Geol., Geophysicist, Manager Econ. Eval., Dist. Geol. 1948-64. Mem. Am. Assn. Petrol. Geol. (Cert.), Assn. Prof. Geol. Scientists (Cert.), Am. Petrol. Inst., Independent Petrol. Assn. Am., Dom. Petrol. Council (Dir.).

SPENCER, Walter E. (3) (alternate for G. L. Richards): Coastal States Gas Corp., Houston, TX.

AREA E

Charles R. Brammell, Chairman

BRAMMELL, Charles R. (2): Consulting Devel. Geol., Graham Energy, Metairie, LA 1980-. CNG Producing Co., Mgr. Development (New Orleans) 1980; Chief Devel. Geol. 1977-80; Devel. Geol. 1973-77. Gulf Oil Corp., Expl. & Devel. Geol. 1960-73 and 1957-58. Sinclair Oil & Gas, Expl. & Devel. Geol. 1959-60. Hycalog, Mudlogging Engr. 1958-59. Mem. New Orleans Geol. Soc.

McELROY, John H. (1): Sr. Coord., Expl. & Prod. Serv., Texaco Inc., Bellaire, TX, 1977-; Expl. Coord. 1972-77; Midland Asst. Div. Mgr. 1969-72; Houston Div. Geol. 1967-69; Houston Asst. Div. Geol. 1961-67; Geol. 1958-61. Seaboard Oil Co., Geol., Asst. Dist. and Dist. Geol. 1951-58. Gulf Oil Corp., Surf. and Subsurf. Geol. 1948-51. Mem. Am. Assn. Petrol. Geol.

*RASSINIER, E.A. (8): Dir.-Resource Planning, Trunkline Gas Co., Houston, TX 1964-; Ch. Petrol. Engr. 1953-64. Phillips Petrol. Co. (Prod. Dept.), Supv. Petrol. Engr. (Bartlesville, OK) 1951-52, Reg. Reservoir Engr. (Houston) 1947-50, Div. Reservoir Engr. (Oklahoma City) 1946, Petrol. Engr. (Bartlesville) 1944-45; (Refining Dept.) Assoc. Design Engr. (Bartlesville, Borger, Kansas City) 1942-43. Mem. Am. Assn. Petrol. Geol., Am. Inst. Min., Met. & Petrol. Engr., Soc. Petrol. Engr., Houston Engr. & Scientific Soc., Houston Geol. Soc., Gas Res. Inst. Indus. Tech. Adv. Comm. (Unconventional Nat. Gas), Reg. Prof. Engr. (TX & MO).

RIEKER, James D. Jr. (1): Mgr. Petrol Engr., Texas Gas Exploration Corp., Houston, TX 1980-; Sr. Res. Engr. and Res. Engr. 1976-80. Amoco Production Co., Res. Engr. and Operations Engr. 1974-76; Prod. Engr. 1973-74. Mem. Soc. Petrol. Engr. of Am. Inst. Min., Met. & Petrol. Engr.

**ROCHESTER, David A. (5): The Fuels Planning Engineer, Public Service Elec. & Gas Co., Newark, NJ 1977-; The Natural Gas Engr. 1971-77; Engr. 1966-71. Mem. Assoc. Gas Distr. (Vice Ch.-Oper. Comm. & Ch. Computer Modeling Comm.), Am. Gas Assn., NJ Gas Assn., Soc. Petrol. Engr., Petrol. Expl. Soc. of NY.

SEAL, Warren L. (1): V. Pres. Division Manager, Florida Exploration Co., New Orleans, LA 1978-. Exchange Oil & Gas Corp., Ch. Geol. 1972-78. Amoco Prod. Co., Ch. Geol. (New Orleans and Houston) 1967-72. Mem. Am. Assn. Petrol. Geol., New Orleans Geol. Soc.

STODDARD, Warren G. (7): Dist. Geol., Atlantic Richfield Co., Lafayette, LA 1967-. Richfield Oil Co., Dist. Geol. (New Orleans) 1962-66, Geol. (Bakersfield, CA) 1951-62. Mem. Am. Assn. Petrol. Geol., Lafayette Geol. Soc., SW LA Geophysical Soc.

YEAGER, John C. (1): Dist. Expl. Geol., S.E. LA Dist., Union Oil of CA, Lafayette, LA 1969-; Area Geol., Middle East, Int. Div. 1966-69; Geol., Tulsa Dist. 1962-66; Geol., Midland Dist. 1960-62. Mem. Am. Assn. Petrol. Geol., Lafayette Geol. Soc., New Orleans Geol. Soc.

AREA G

Jeffery V. Morris, Chairman
Bill C. Burkman, Vice Chairman

BURKMAN, Bill C. (3): Gulf Coast Reg. Geol. and OR Manager, Oil Development Co. of Texas, Houston, TX; Reg. Geol. 1969-. Nat. Gas Pipeline Co. of Am. (Amarillo & Houston), Jr.-Dist. Geol. 1957-69; Independent Geophysical Surveys Corp., Cobounder & Party Ch. 1956-57; Geophysical Serv., Inc., Computer-Asst. / Party Ch. (TX, WY & ND) 1951-56. Mem. Am. Assn. Petrol. Geol., Soc. Expl. Geophysicists, Houston Geol. Soc., Panhandle Geol. Soc.

HORSTMANN, Lane E. (4): Dist. Expl. Manager, Enserch Expl. (Lone Star Producing), Houston, TX 1976-; Dist. Geol. 1970-76. Lone Star Producing Co., Expl. Geol. (Abilene, TX) 1967-70, Expl. Geol. (Midland, TX) 1951-57. Indep. Cons. Geol. (Midland & Cameron, TX) 1957-67. Mem. Am. Assn. Petrol. Geol., Houston Geol. Soc., Houston Assn. Petrol. Landmen, Registered Prof. Engr. (TX).

MAYSE, Robert H. (3): V. Pres., Energy Resources, Houston Pipe Line Co. (Intrastate, Valley Pipe, ENG Fossil Fuels), Houston, TX 1976-; Manager, Hydrocarbon Reserves 1973-76; Manager, Gas Reserves 1970-73; Sr. Reservoir Geol. 1967-70; Reservoir Specialist (Houston) 1962-66. Mem. Am. Assn. Petrol. Geol. (Cert.), Assn. Prof. Geol. Scientists (Cert.), Houston Geol. Soc., Soc. of Petrol. Engr., Am. Inst. Min., Met. & Petrol. Engr.

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Orleans) 1956-59. Gulf Oil Corp., Geol. (New Orleans) 1954. Mem. Am. Assn. Petrol. Geol., Houston Geol. Soc. (Pres. 1978-79), Natural Gas Men of Houston.

**SULLIVAN, Richard A. (6): Pres., So. County Gas and Bristol & Warren Gas Co., Hingham, MA 1959-. Boston Transit System, Exec. & Consulting Eng. 1949-58. Detroit Transit System, Gen. Manager 1945-58. City of Detroit, Public Util. Anal. 1942-45. U.S. Engr., Consulting Engr. 1941-42. MA Dept. Public Util., Elec. Engr. 1937-41. Mem. Am. Gas Assn., NE Gas Assn., Harvard Engr. Soc., MA Soc. Prof. Engr., NH Bar Assn.

AREA H

James A. Barlow, Jr., Chairman
C. Keith Fisher, Vice Chairman

BARLOW, James A. Jr. (3): V. Pres., Barlow & Haun, Inc., Casper, WY 1957-. Forest Oil Corp., Geol. 1953-57. Ohio Oil Co., Geol. 1952-53. Mem. Am. Assn. Petrol. Geol., Assn. Prof. Geol. Scientists, Geol. Soc. Am., Rocky Mtn. Assn. Geol., WY Geol. Assn., Independent Petrol. Assn. Mtn. States.

FISHER, C. Keith (2): Reg. Geol., Panhandle Eastern Pipe Line Co., Denver, CO 1977-. U.S. Geological Survey, Geol. (Denver) 1974-77. Indep. Geol. (Denver) 1973-74. American Stratigraphic Co., Gen. Mgr., Vice Pres. (Denver) 1961-73; Manager (Billings & Casper) 1955-61. Canadian Stratigraphic Serv., Ltd., Geol. (Calgary) 1952-55. Panhandle Eastern Pipe Line, Geol. (Liberal, KS) 1949-52. Mem. Am. Assn. Petrol. Geol., Am. Inst. Prof. Geol., Rocky Mtn. Assn. Geol., WY Geol. Assn., MT Geol. Soc.

**GOLDEN, Jerry B. (3): Development Geol., Mountain Fuel Supply Co., Salt Lake City, UT 1968-. Shell Oil Co., Field Asst. (Farmington, NM) 1965-66. Mem. Utah Geol. Assn.

HAWK, David H. (3): V. Pres. Expl., Sundance Oil Co., Denver, CO 1980-. IGC Production Co., V. Pres. & Gen. Mgr. and Intermountain Gas Co. (Boise, ID); Mgr. Expl. & Prod. 1977-80; Nat. Res. Advisor 1973-76. Tenneco Oil Co., Expl. Geol. (Denver) 1972-73. Atlantic Richfield, Expl. Geol. (Dallas, TX & Lafayette, LA) 1970-72. Mem. Am. Assn. Petrol. Geol. (Energy Minerals Div.), ID Assn. Prof. Geol., Geol. Soc. Am., Rocky Mtn. Assn. Geol., Geothermal Resource Council, Am. Gas. Assn.

KIDWAI, Moid (3): Sr. Reservoir Engr., Northern Natural Gas Co., Denver, CO, 1980-; Sr. Reservoir Engr. (Omaha, NB) 1978-80; Reservoir Engr. 1975-77. Metro Subway, Geol. (Washington, DC) 1974-75. Oil & Gas Development Corp., Petrol. Engr. (Pakistan) 1968-72. Mem. Am. Assn. Petrol. Geol., Am. Gas Assn., Soc. Petrol. Engr.

McPEEK, Lawrence A. (1): Cons. Geol., Denver, CO 1971-. Koch Expl. Co., Expl. Mgr., Rocky Mtn. Reg. (Denver) 1968-71. Amoco Prod. Co., Expl. Geol. (Denver and New Orleans) 1961-68. Mem. Am. Assn. Petrol. Geol., Rocky Mtn. Assn. Geol., WY Geol. Assn.

MOTSCH, A. Sherrill (1): Dist. Devel. Geol., Marathon Oil Co. (formerly The Ohio Oil Co.), Casper, WY 1979-; Devel. Geol. 1967-79; on staff of Div. Geol. & Div. Expl. Mgr. 1957-66; Field & Devel. Geol. (Cody, WY) 1953-57; Field Geol. (Rawlins, WY) 1951-53. Mem. WY Geol. Assn.

MURRAY, D. Keith (7): Expl. Proj. Mgr., Expl. & Min. Div., Colorado School of Mines Research Institute, Golden, CO 1979-. CO Geol. Surv., Denver, CO 1973-79. Coronado Oil Co., Consulting Geol. (Denver) 1969-73. Sinclair Oil Corp. (Denver) 1966-69. Consulting Geol. (Denver) 1962-66. Clark Oil & Refining Corp. (Denver) 1960-62. Indep. Geol. (Los Angeles) 1959-60. Manabi Expl. Co. (Ecuador, SA) 1956-58. Shell Oil Co. (CA, UT, NV, LA) 1953-56. Mem. Am. Assn. Petrol. Geol. (Program Councillor, Energy Minerals Div., Natl. AAPG V. Pres. 1979-80), Am. Inst. Prof. Geol., CO Sci. Soc., Denver Coal Club, Geol. Soc. Am., Rocky Mtn. Assn. Geol., Rocky Mtn. Coal Min. Inst., WY Geol. Assn.

OTT, Henry L. (2): Rocky Mtn. Div. Geol., Chevron U.S.A. Inc., Denver, CO 1975-; Geol. (Denver) 1972-74. Western Australia Petrol. Proprietary Ltd. (Perth), Reg. Strat. Paleon. 1967-71. Mem. Am. Assn. Petrol. Geol., Rocky Mtn. Assn. Geol., WY Geol. Assn.

POWERS, Richard B. (2): Geol., U.S. Geological Survey, Oil & Gas, Lakewood, CO 1974-. Consultant (Denver) 1971-74. Bolyard & Assoc., V. Pres. (Denver) 1968-71. Tenneco Oil, Sr. Staff Geol. (Houston) 1967-68; Dist. Geol. (Casper) 1965-67; Dist. Mgr. (Pittsburgh) 1962-65; Reg. Geol. (Casper & Denver) 1959-62. Petrobras, Geol. (Belem, Brazil) 1958-59. Pure (Union) Oil Co., Geol. (Grand Junction, CO) 1952-58. Mem. Am. Assn. Petrol. Geol. (Membership Committee), Rocky Mtn. Assn. Geol., WY Geol. Assn., Canadian Soc. Petrol. Geol.

SANBORN, Albert F. (2): Consulting Geol., Denver, CO 1978-. Chevron U.S.A., Sr. Geol. (Denver) 1963-78; Div. Stratigrapher (Salt Lake City) 1959-63; District Stratigrapher 1955-59; Geol.-Stratigrapher 1954-55; Geol.-Stratigrapher (Los Angeles) 1952-54. Mem. Am. Assn. Petrol. Geol., Assn. Ind. Petrol. Geol., Rocky Mtn. Assn. Geol.

*STRACKE, Kenneth J. (3): Director, Northwest Pipeline Corp., Salt Lake City, UT 1975-. Consultant (Salinas, CA) 1974-75. Union Oil Co. of CA, Dist. Mgr. (Santa Rosa, CA) 1972-74; Dist. Oper. Mgr. (Orcutt, CA) 1969-72; Dist. Prod. Supt. 1968-69; Dist. Engr. 1968; Engr Supv. (Coalinga, CA) 1962-68; Petrol. Engr. (San Joaquin Valley, CA) 1954-62. Mem. Am. Gas Assn. (Expl. & Prod. Comm.), Reg. Prof. Engr. UT, Soc. Petrol. Engr. of Am. Inst. Min., Met. & Petrol. Engr. (Chmn. San Joaquin Valley, CA Sec. 1962).

WOSICK, Fred D. (2): Geol., Montana-Dakota Utilities Co., Bismarck, ND 1977-. Mem. ND Academy of Science, ND Geol. Soc., MT Geol. Soc., WY Geol. Assn.

AREA I

Robert D. Habbit, Chairman

ALLSHOUSE, Edward M. (2): Sr. Reservoir Geol., El Paso Natural Gas Co., El Paso, TX 1973-. Mem. Am. Assn. Petrol. Geol., Am. Inst. Min., Met. & Petrol. Engr., El Paso Geol. Soc.

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DAVIES, David J. (2): Geol., Expl. and Dev., Southern Union Exploration Co. (SX), Dallas, TX 1977-. Enserch Exploration, Inc. (Lone Star Producing Co.), Geol. (Dallas) 1975-77. Mem. Am. Assn. Petrol. Geol., Soc. Econ. Paleon. and Min., Dallas Geol. Soc.

**GASS, Bernard (2): Manager, Fuel Supply, Arizona Public Service Co., Phoenix, AZ.

HABBIT, Robert D. (4): Mgr. Reservoir Engineering, El Paso Natural Gas Co., El Paso, TX 1978-; Mgr. Reservoir Studies 1978; Consulting Reservoir Geol. 1977-78; Staff Geol. 1966-77. Indep. Geol. (Houston) 1965-66. El Paso Natural Gas Co., Sr. Reservoir Geol. (Houston) 1957-65. Sohio Petroleum Co., Geophysicist/Geol. (Gulf Coast-Rky. Mtn.) 1954-57. Mem. Am. Assn. Petrol. Geol. (CPG #166), Am. Inst. Prof. Geol. (Cert. #2489), Am. Inst. Min., Met. & Petrol. Engr., Soc..Expl. Geophysicists, Rocky Mtn. Assn. Geol., El Paso Geol. Soc.

KOTTLOWSKI, Frank E. (2): Dir. & Sr. Geol., NM Bureau of Mines & Mineral Resources, Socorro, NM 1974-; Assoc. Dir., Sr. Geol., Econ. Geol. 1951-74. Indiana Geol. Surv., Party Chief, Coal Div. 1947-51. Indiana Univ. Geol. Dept., Inst. 1950-51. Mem. Am. Assn. Petrol. Geol. (Editor 1971-75), Geol. Soc. Am. (Fellow), Soc. Econ. Geol., Assn. Am. State Geol., Soc. Econ. Paleon. & Min., Assn. Prof. Geol. Scientists (Past Pres. NM section), Am. Assn. Adv. Science (Fellow).

KRIVANEK, Connie M. (2): Sr. Geol., Mountain Fuel Supply Co., Farmington, NM 1976-. Union Oil Co. of CA, Geol. (Midland, TX) 1976; (Durango, CO) 1967-76; (Olney, IL) 1967. Superior Oil Co., Geol. (New Orleans) 1965-67; (Bakersfield, CA) 1964-65; (Anchorage, AK) 1963-64; (Casper, WY) 1963. Mem. Am. Assn. Petrol. Geol., Rocky Mtn. Assn. Geol., Four Corners Geol. Soc., Am. Inst. Prof. Geol. (Cert. #2820).

*VAUGHAN, W.L. (3): Gen. Mgr. Reserves Evaluation Dept., Texas Eastern and Transwestern Pipelines, Houston, TX 1973-. Texas Eastern Trans. Corp., Asst. Mgr., Reserves and Deliverability 1972-73, Jr. Petrol. Engr.-Engr. (Gas Supply Dept.) 1957-72. Mem. Am. Gas Assn. (Chmn., Underground Gas Storage Comm.), Soc. Petrol. Engr., Nat. Gas Men Permian Basin.

AREA J-N

Alan F. Chatfield, Chairman
Joe E. McGarrah, Vice Chairman

CHATFIELD, Alan F. (3): Chief Geol., Berry Petroleum Corp., Oklahoma City, OK 1980-. French Oil Co., Expl. Mgr. 1980. GHK Corp., Expl. Mgr. 1976-80. Carlsberg Petrol. Corp., Sr. Staff Explorationist (CA) 1974-76. Oceanic Expl. Co., Geophysicist & Local Overseas Mgr. 1973-74. Continental Oil Co., Geophysicist 1972-73. GHK Corp., Geophysicist 1971. Humble Oil & Refining Co., Geophysicist (TX & OK) 1967-71.

CURRY, James K. (8): Mgr., Rocky Mtn. Region Panhandle Eastern Pipe Line Co., Denver, CO 1975-; Mgr. Expl. & Prod. (Pan Eastern Expl., Houston) 1973-75; Mgr. Expl., Mgr. Geol., Dist. Geol., Geol., Jr. Geol. (Liberal, KS) 1946-72. Mem. Am Assn. Petrol. Geol., Soc. Petrol. Engr., Rocky Mtn. Assn. Geol., Rocky Mtn. Nat. Gas Men's Assn., Assn. Prof. Geol. Scientists (Cert. #4353).

**McGARRAH, Joe E. (3): Sr. Geol., Oklahoma Nat. Gas Co., Tulsa, OK 1973-. National Assn. Petrol. Co., Regional Geol. (Tulsa) 1956-73. Frost Geophysical Co., Geophysicist Training (Tulsa) 1954-56. U.S. Air Force Intelligence Div., Photo Interpreter 1952-53. U.S. Geol. Surv., Topographic Engr. (Rolla, MO) 1951-52. Mem. Am. Assn. Petrol. Geol., Tulsa Geol. Soc., OK City Geol. Soc., Rocky Mtn. Assn. Petrol. Geol., OK Gas Men's Assn.

*WADE, Philip J. (2): Mgr. Anadarko Supply Evaluation, Northern Natural Gas Co., Tulsa, OK 1978-; Dir. Supply Operation (Midland, TX) 1976-78; Production Engr. 1976. Hilliard Lyons (Bowling Green, KY) 1975-76. Cities Service Oil Co., Petrol. Engr. (Oklahoma City) 1972-74; Prod. Engr. (Liberal, KS) 1971-72. Mem. Soc. Petrol. Engr., Nat. Gas Men of Permian Basin, Am. Gas Assn. (Mid-Continent Reserve Comm.).

AREA J-S

Charles M. Allen, Chairman
James F. Fleming, Vice Chairman

ALLEN, C. M. (8): Consultant, Expl. & Prod. Affairs — Industry & Govt., No. Am. Expl. & Prod. Div., Phillips Petrol. Co., Bartlesville, OK 1944-. Adv. Board to Dept. of Geol., Univ. KS 1973-. Mem. Am. Assn. Petrol. Geol. (Comm. on Statistics of Drlg.), Nat. Petrol. Council (Comm. on Emergency Preparedness 1974-76, Comm. on U.S. Energy Outlook 1970-73), Fed. Power Comm. Natl. Gas Surv. (Gas Supply Task Force 1971-75). Has testified in numerous state conservation agency, state and federal courts, and Fed. Power Comm. proceedings (including all major area and national rate proceedings), and hearings before Senate and House Congressional Committees.

*CURRY, James K. (8): Mgr., Rocky Mtn. Region Panhandle Eastern Pipe Line Co., Denver, CO 1975-; Mgr. Expl. & Prod. (Pan Eastern Expl., Houston) 1973-75; Mgr. Expl., Mgr. Geol., Dist. Geol., Geol., Jr. Geol. (Liberal, KS) 1946-72. Mem. Am Assn. Petrol. Geol., Soc. Petrol. Engr., Rocky Mtn. Assn. Geol., Rocky Mtn. Nat. Gas Men's Assn., Assn. Prof. Geol. Scientists (Cert. #4353).

**FLEMING, James F. (2): Staff Reservoir Engr., Northern Natural Gas Co., Midland, TX 1973-. Exxon, Engr. 1954-73. Mem. Soc. Petrol. Engr., Am. Gas Assn. (Rocky Mountain subcommittee).

AREA K

Alexander Sisson, Chairman

CARPENTER, JoAnn (1) (alternate for James E. Schroeder): Pacific Alaska LNG Associates, Anchorage, AK.

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HARTMAN, Donald C. (4): Geologist, Landman, Texaco Inc., Anchorage, AK 1975-. AK State Geol. 1973-74; AK Petrol. Geol. 1971-73. Texaco Inc., Geol. (Los Angeles and Anchorage) 1956-71. Mem. Am. Assn. Petrol. Geol., AK Geol. Soc., AK Assn. Petrol. Landmen.

HITE, David M. (1): District Geol., ARCO Oil & Gas Co., Anchorage, AK 1979-; Sr. Staff Geol. (Dallas) 1977-79; Sr. Geol. (Anchorage) 1975-77; Sr. Research Geol. (Dallas) 1970-74; Research Geol. 1967-70. Mem. AK Geol. Soc.

LIAN, Ernest B. (4): Sr. Geol., Marathon Oil Co., Anchorage, AK 1965-; Dist. Geol. (Bakersfield) 1963-65; Geol. & Dist. Geol. (Los Angeles) 1950-63. Mem. Am. Assn. Petrol. Geol., AK Geol. Soc., Geophysical Soc. AK.

McKEEVER, John H. (1): Staff Geol., Amoco Production Co., Anchorage, AK 1966-; Geol. (Western Canada and Northern Rocky Mountains) 1948-66. California Standard Co., Geol. (Canada) 1947-48. Mem. AK Assn. Petrol. Landmen, AK Geol. Soc., Am. Assn. Petrol. Geol., Geol. Soc. Am. (Fellow), Geophy. Soc. AK, Soc. Expl. Geophy.

McMULLIN, Robert H. (1): Geol., Branch of Oil & Gas Resources, U.S. Geol. Survey, Anchorage, AK 1979-; Area Geol. 1976-79; OCS Evaluation Supervisor 1975-76; Geophysicist, Conservation Div. 1971-75. Chevron U.S.A. Inc., Expl. Geol. & Geophysicist (CA, WA, OR, NV, AK) 1955-71. Mem. AK Geol. Soc., Am. Assn. Petrol. Geol., Geophy. Soc. AK, Soc. Econ. Geol.

*SCHMIDT, Harold F. (4): Sr. V. Pres., Alaska Pipeline Co./Alaska Gas & Service Co., Anchorage, AK 1978-; V. Pres. 1962-78. Public Serv. Co. of CO, Gas Utilization Engr. (Denver) 1955-62. Southern CA Gas Co., Indust. Serv. Tech. (Los Angeles) 1954-55.

**SCHROEDER, James E. (3): Geol. Supv., Sr. Geol., Planning Geol., Southern California Gas Company, Los Angeles, CA 1973-. Standard Oil Co. of CA, Expl. Geol. (La Habra & San Francisco) 1967-73. Mem. Am. Assn. Petrol. Geol., Soc. Expl. Geophysicists, AK Geol. Soc., Rocky Mtn. Coal Inst.

SISSON, Alexander (4): Sr. Geol., Union Oil Co. of California, Anchorage, AK 1966-. Esso Standard Oil, Sr. Geol. (Bogota) 1964-66; Geol. (Guatemala) 1961-63; Geol. (Havana) 1957-60. Carter Oil Co., Geol. (Denver) 1951-56. Mem. Am. Assn. Petrol. Geol. (Environmental Comm.), AK Geol. Soc. (Pres. 1977).

AREA L

William F. Edmondson, Chairman
Wesley E. Franklin, Vice Chairman

CASS, John T. (1): Div. Geol., Rocky Mtns., Four Corners area, Western U.S., Alaska, offshore, Texaco Inc., Los Angeles, CA 1955-. U.S. Geol. Survey, Alaska, 1951-55. Mem. Am. Assn. Petrol. Geol.

EDMONDSON, William F. (7): Consultant, Bakersfield, CA 1980-. Mariposa Petroleum Co., V. Pres. (Bakersfield) 1976-80. Westates Petroleum Co., Geol. 1975. Consultant (Sacramento Valley) 1959-74. Superior Oil Co., Geol. 1957-59, 1952-54. Mem. Am. Assn. Petrol. Geol., San Joaquin Geol. Soc.

FRANKLIN, Wesley E. (1): Division Geol., Tenneco Oil Co., Bakersfield, CA 1978-; Geol. 1973-78. Gulf Oil Co., Prod. Geol. (Morgan City, LA) 1969-71. Mem. Geol. Soc. Am., Am. Assn. Petrol. Geol. (Pacific Sec.), San Joaquin Geol. Soc., Soc. Econ. Geophys., Soc. Econ. Paleon. & Min.

GARSIDE, Larry J. (3): Energy Resources Geol., Nevada Bureau of Mines and Geology, Mackay School of Mines, Univ. of Nevada, Reno, NV 1968-; Research Asst. 1965-67. Nevada Oil and Gas Conservation Commission, Executive Secretary 1974-75. Mem. Am. Assn. Petrol. Geol. (Mem. Energy Resources Div.), Geol. Soc. Am. (Fellow), Geol. Soc. NV (Sec.-Treas. 1969-70; Pres. 1973-74), Geothermal Resources Council, Soc. Econ. Geol.

HALL, Edward A. (6): Sr. Geol., Expl. Dept., Union Oil Co. of CA, Ventura, CA 1978-; Sr. Geol. Expl. (Santa Paula, CA) 1972-78; Sr. Geol. Expl. (Los Angeles) 1963-72; Dist. Geol. (So. CA offshore) 1961-63; Dist. Geol. (So. CA onshore) 1951-61; Field & Wellsite Geol. (Santa Paula) 1945-51. Mem. Am. Assn. Petrol. Geol., Am. Inst. Prof. Geol. (Cert. #204), Coast Geol. Soc., Reg. Geol. CA (Lic. #145), Soc. Econ. Paleon. & Min. (Pac. Coast Sec.).

*LUDWICK, L. E. (6): Manager, Reservoir Geology. Reservoir Engineering Dept., El Paso Natural Gas Co., Houston and El Paso, TX 1954-. Standard Oil Co. of TX, Development Geol. 1950-54. Caran Bros. Engr. Co., Well Logging Engr. 1950. Mem. Am. Assn. Petrol. Geol., Soc. Petrol. Engr., Am. Gas Assn. (Natural Gas Reserves Comm.), El Paso Geol. Soc.

**SEGO, Peter D. (2): Dist. Geol., California/Mid-Continent, Southern California Gas Co., Los Angeles, CA 1978-. Carlsberg Petroleum, Sr. Staff Geol. (Los Angeles) 1976-78. Texaco Inc., Expl. Geol./Environ. Coordinator (Los Angeles) 1969-76. Mem. Am. Assn. Petrol. Geol., Los Angeles Basin Geol. Soc., West TX Geol. Soc., OK City Geol. Soc.

WAINWRIGHT, Kenneth E. (1): Sr. Geol. Assoc., ARCO Oil & Gas Co., Bakersfield, CA 1979-; Sr. Geol. 1977-79; Geol. 1970-77; Geol. (Roswell, NM) 1967-70; Geol. (Denver, CO) 1962-67. Mem. Am. Assn. Petrol. Geol., San Joaquin Geol. Soc.

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**Gas Distributors representative.

WATERMAN, Douglas R. (5): Dist. Supv., Expl. Dept., Western Region, Chevron U.S.A. Inc., San Francisco, CA; Dist. Supv., Sacramento-San Joaquin Dist.; Dist. Supv., Coastal District, So. CA; Dist. Geol., Ventura and Western Dist.; Area Geol., Santa Barbara Channel; Seismic Crew Rep., LA & Sacramento Basins, Salton Trough, Cook Inlet AK, So. Ca; Dist. Geol., Salinas & So. San Joaquin Basins; Geol., Subsurface Geol.; Geol., Oil Field Study & Sec. Recovery; Geol., Well Site Geol. Mem. Am. Assn. Petrol. Geol., CA Reg. Geol. (#695), Northern CA Geol. Soc.

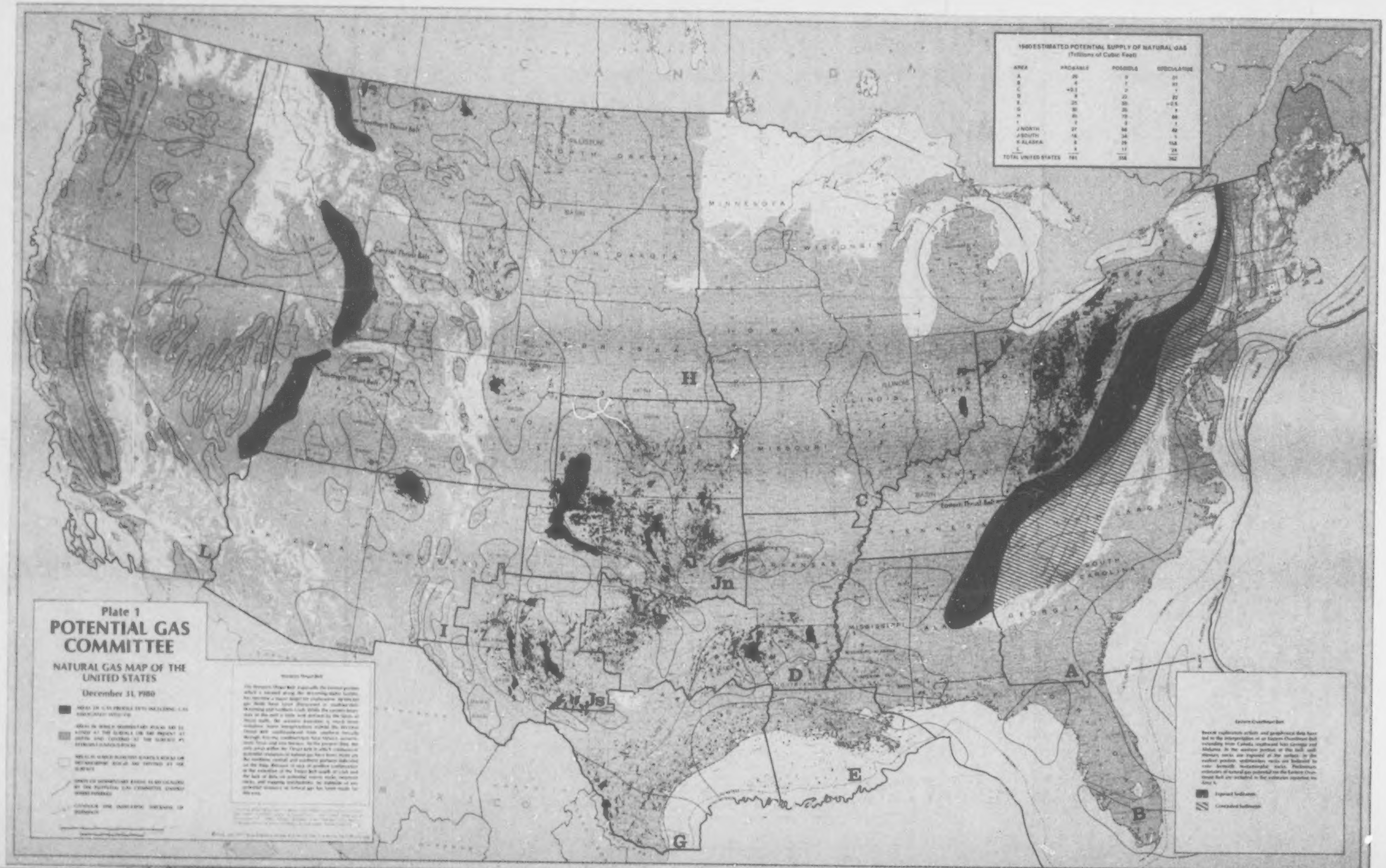

Plate 1

POTENTIAL GAS COMMITTEE

NATURAL GAS MAP OF THE UNITED STATES

December 31, 1980

1980 ESTIMATED POTENTIAL SUPPLY OF NATURAL GAS
(Trillions of Cubic Feet)
AREA
PROBABLE
POSSIBLE
SPECULATIVE
J NORTH
J SOUTH
K ALASKA
TOTAL UNITED STATES
CANADA
MEXICO
MINNESOTA
WISCONSIN
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
IOWA
MISSOURI
ILLINOIS
INDIANA
KENTUCKY
TENNESSEE
MISSISSIPPI
GEORGIA
SOUTH CAROLINA
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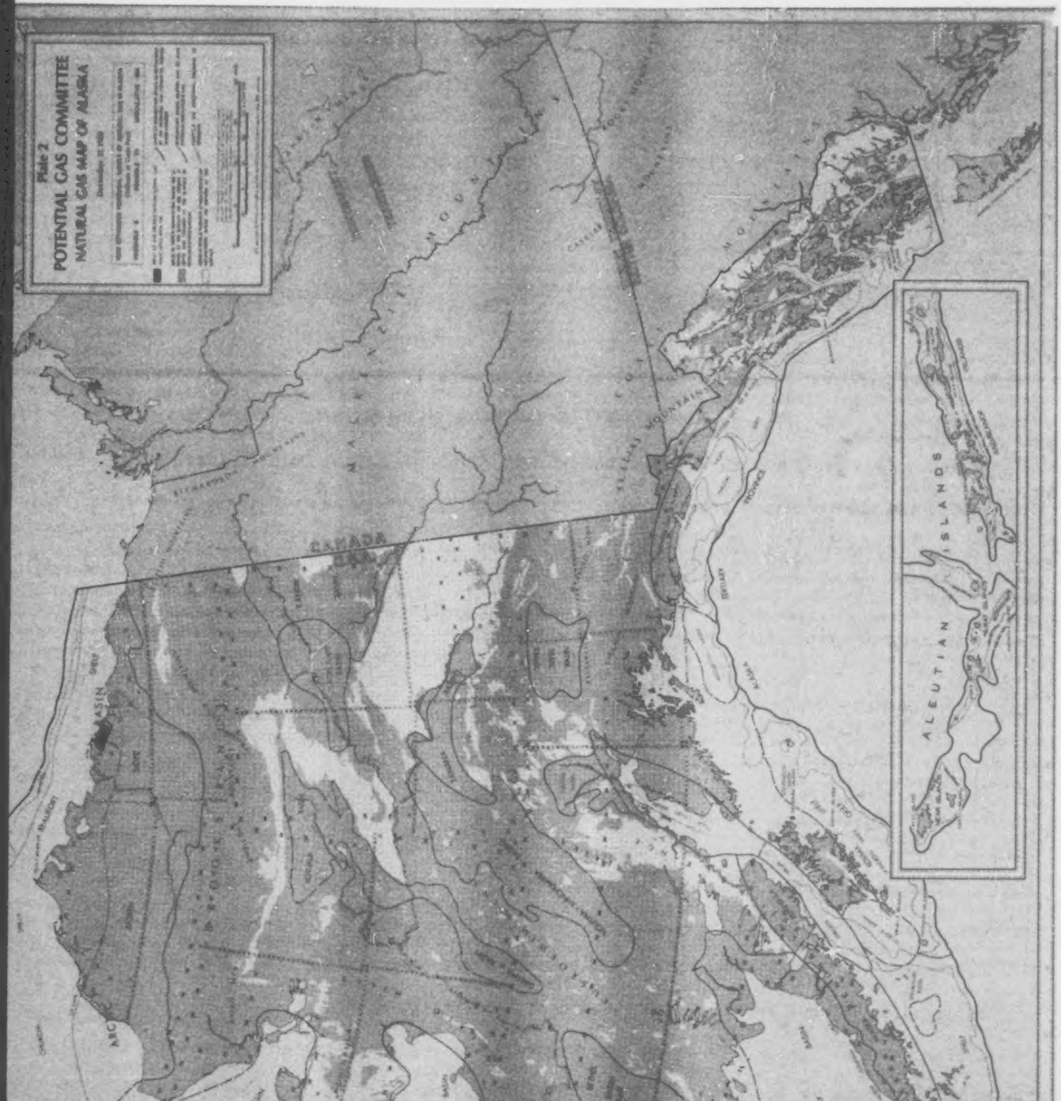
Plate 2
POTENTIAL GAS COMMITTEE
NATURAL GAS MAP OF ALASKA
CANADA
MACKENZIE MOUNTAINS
ST. ELIAS MOUNTAINS
COAST MOUNTAINS
ARC
BASIN
NORTON SOUND
BRISTOL BAY
PROVINCE
ST. GEORGE
NAVARIN
ALEUTIAN ISLANDS

NEWS RELEASE

Potential Gas Agency
Harry C. Kent, Director
(303) 279-4320

Colorado School of Mines
golden, colorado 80401

February 26, 1983

FOR RELEASE FEBRUARY 28, 1983

Washington, D C --The Potential Gas Committee today officially released their evaluation of the undiscovered natural gas resource potential of the United States based on data available through the end of 1982. The results of this evaluation reaffirmed the Committee's belief that U S natural gas resources provide a foundation for meeting the Nation's natural gas energy needs well into the 21st century.

Table 1--Estimated potential supply of natural ga
(trillions of cubic feet at 14 73 psia and 60° F.

	Probable	Possible	Speculative
Lower 48 States			
--Onshore	151	263	179
--Offshore	33	63	53
Alaska			
--Onshore	6	16	28
--Offshore	2	13	69
Total United States	192	355	329

Committee Chairman J C. Herrington, in a speech before the 10th Energy Technology Conference in Washington, D.C., pointed out some paradoxes in the current potential supply picture, but stressed that results of exploration and drilling activity during the past two years have basically reinforced the Committee's position that more than one-half of the resource originally existing in the country still remains to be found and more than 60% remains to be produced. Herrington stressed further that consumers can be assured of the existence of adequate supplies of recoverable natural gas to meet the demands for this valuable fuel for the foreseeable future. In fact, the industry currently has productive capacity in excess of market demands.

Results of accelerated drilling activity through 1981 and high rates of successful well completions through 1982, in addition to the previous accumulated knowledge about the gas resource, have led the Committee to estimate the total potential remaining gas to be discovered to be approximately 876 trillion cubic feet (Tcf). This is a decrease of 37 trillion cubic feet from the year-end 1980 estimate. Herrington pointed out that this decrease is approximately equal to the gas discovered (additions to proved reserves) that occurred over the past two years. This means that there has been no significant new information developed during the past two years which would have caused the Committee to alter substantially its previous concept of the Potential Supply.

Viewed from a closer perspective, though, the national total estimate is a combination of regional estimates and these regional estimates have individually been increased and decreased. Frontier areas, such as Alaska and portions of the Rocky Mountain states, tend to have major changes because the exploratory plays are in the early stages of development, while other areas have been more stable. The estimate for the Rocky Mountain states has been increased largely because of inclusion of quantities of low-heat-content gas in western Wyoming. Additional potential is also believed to exist in some areas in central Wyoming where sedimentary rocks are now known to occur beneath major thrust faults. It is now believed that the low-heat-content gas can be commercially developed and the sub-thrust sediments provide additional targets for exploration. The increases in the Rocky Mountains partly offset decreases in estimates for other areas.

The estimate of potential for the Mid-Continent area (Area J-North), particularly Oklahoma, was decreased due to transfers from potential resources to proved reserves and to better evaluation of the potential made possible by recent high levels of drilling activity. This activity confirmed some estimates made previously but there have been disappointments also in some areas such as the deep Pennsylvanian Springer sands in the southeastern part of the Anadarko basin. The estimate for California, Oregon, Washington and Nevada (Area L) has been reduced primarily because of a re-evaluation of the potential for the San Joaquin basin plus transfers to proved reserves. Recent seismic work and wildcat drilling have diminished what had been considered to be prospective acreage in Alaska (Area K), for example, portions of the Arctic basin, the Gulf of Alaska, the Lower Cook Inlet and the Kodiak area.

Estimates for the other areas of the country show no significant changes other than those expected by normal developments. These include the relatively mature exploration and production areas of Texas (Areas D, G and J-South) and Louisiana (Area E) which have shown consistent declines in estimates of future gas potential as their gas resources have been developed and produced.

With the coming of age of improved completion technology for tight formations and a price incentive granted by regulatory agencies, this formerly "unconventional" gas resource is rapidly increasing in importance as a "conventional" resource. In fact, a review of all areas where the Potential Gas Committee now estimates conventional natural gas potential indicates that as much as 20%, 172 Tcf, of this so-called "tight gas resource" may be included in the current estimate. These quantities have been incorporated gradually, over a number of years, into the Committee's estimates. There exists a strong probability that these quantities have also been included in the "unconventional" estimates of others.

Committee members are decidedly optimistic about the future. They believe that their estimates, based on the data available to the Committee at this time, present a reasonable picture of the resource base and provide a foundation for estimates of continued adequate supplies of natural gas to meet the Nation's energy needs into the 21st century.

Copies of the complete report, "Potential Supply of Natural Gas in the United States, as of December 31, 1982," are planned for release in June 1983. The publication may be ordered from Potential Gas Agency, Colorado School of Mines, Golden, Colorado 80401.

Potential Gas Agency--
February 26, 1983

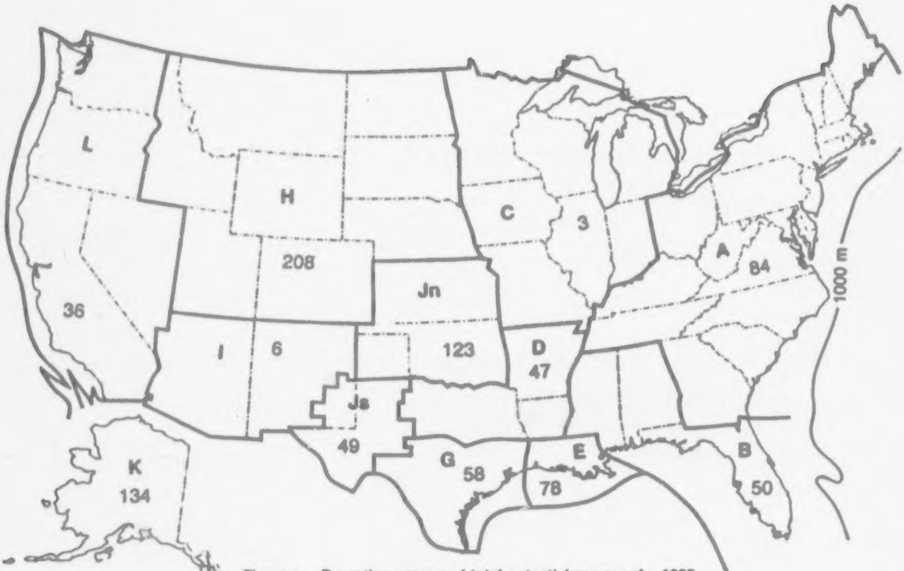

Figure 1— Reporting areas and total potential gas supply, 1982
Potential Gas Committee

Table 2--Estimated potential supply of natural gas
in United States by geographic areas
as of December 31, 1982

(trillions of cubic feet at 14.73 psia and 60° F.)

Area		Probable	Possible	Speculative
A	Onshore	27	8	33
	Offshore	--*	--	16
B	Onshore	6	6	7
	Offshore	1	2	28
C	Onshore	--	2	1
D	Onshore	8	20	19
E	Onshore	6	15	--
	Offshore	21	36	--
G	Onshore	12	15	4
	Offshore	11	16	--
H	Onshore	49	93	66
I	Onshore	2	3	1
J-North	Onshore	24	60	39
J-South	Onshore	15	33	1
L	Onshore	2	8	8
	Offshore	--	9	9
	48 States Subtotal	184	326	232
K	Alaska -- Onshore	6	16	28
	-- Offshore	2	13	69
	Total United States	192	355	329

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* Dashes are used to represent estimates of potential of less than 0.5 Tcf

NATURAL GAS LEGISLATION

TUESDAY, MARCH 29, 1983

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Oklahoma City, Okla.

The committee met, pursuant to notice, at 10 a.m., in the Lincoln Plaza Forum, Senate Room, Oklahoma City, Okla., Hon. Don Nickles, presiding.

Present: Senator Nickles.

Also present: Howard Useem, professional staff member; and Elizabeth Moler, counsel for the minority.

OPENING STATEMENT OF HON. DON NICKLES, A U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator NICKLES. Good morning. I want to thank everyone here and the individuals who are going to testify before this hearing on natural gas deregulation, and the administration's bill, S. 615. That bill calls for the deregulation of natural gas by January 1, 1986 with some interim controls, some of which many of us have reservations.

I think it's very, very important to have input from Oklahomans. As all of you are very well aware, the natural gas industry affects every Oklahoman. It affects, really, every consumer in the United States, so it's an extremely important and sensitive issue.

Presently we've already had 5 days of hearings in Washington on natural gas deregulation as outlined in the administration's bill. That's a considerable amount of time and input before one committee. We intend on having 1 additional day of hearings with administration's witnesses. Secretary Hodel, I believe, is scheduled to testify again for the administration for followup to answer some additional questions that have arisen. We will then hope to be marking up a modified draft or working off the administration's bill.

We've scheduled several days of hearings prior to the summer recess to begin work on this legislation; having this hearing in Oklahoma City and yesterday in Tulsa. I think it is very, very important to have some input from people who are directly impacted, directly affected and who are very knowledgeable with hands-on experience in the natural gas industry as to how these various bills and proposals would affect them, how it would affect their customers and their consumers; the people who utilize natural gas as a vital component of their life and their business. So I think these hearings are worthwhile. The witnesses that we have today come from diverse backgrounds. We're going to start the day with Tom Cantrell, who is a Deputy Assistant

Secretary at the Department of Energy. He also, for your information, is a native Oklahoman and I think he'll provide some good expertise and a brief background or description of the administration's bill.

Also, I hope that our witnesses and panelists today will discuss some of the other legislative proposals that are before Congress.

In addition to Secretary Hodel's bill, we have several other pieces of legislation that have been introduced: Some call for a 2-year price freeze, some of them have rollbacks, and some of them call for total abrogation of contracts. So there are a lot of different proposals that are before us.

Natural gas will be in my opinion a very hotly contested item, probably the most hotly contested item that we'll have in the energy field. Perhaps this is one of the most difficult issues that we have before us in Congress this year.

So the input from many of you will be sincerely appreciated by myself and I think will be helpful to not only myself, but the entire Senate and Congress as we wrestle with these issues. I personally believe that it's very, very important for us to move as rapidly as possible for the total deregulation of all natural gas.

Under the present Natural Gas Policy Act, we find that we have a maze or quagmire of rules and regulations that has under present law 28 different price categories for the same product, natural gas. This has caused a lot of misallocation of a very precious, very valuable resource, which I think the marketplace can much better allocate that resource than the Federal Government can.

The purpose of this hearing and the purpose of our efforts in Washington, D.C. will be to try to move as quickly and orderly as possible to a free market. We want market allocation of natural gas and not have the Federal Government be the allocator and also the pricing controller that has misallocated these resources in the past and caused many of the shortages. In some cases I think we'll find such regulation actually caused the prices to exceed what they really would be under normal market circumstances.

So with that little introduction, I want to thank again the variety of experts that we have today. In addition to Mr. Cantrell, we have a group of representatives with small producing interests, royalty owners, independent producers, major producers, and citizens groups. All have indicated an interest to testify to give us, I think, a wide perspective on natural gas legislation an how it would affect their lives. So I thank you very much for coming out this morning and look forward to hearing your testimony.

Since we have a lot of persons who have indicated a desire to testify before the committee, we would appreciate it if each individual would limit their remarks to 10 minutes. We are going to add to the stated panels several additional persons that have indicated a desire to speak before the committee.

So we're going to try to accommodate everybody, but that won't be possible unless we can manage our time efficiently, so if individuals would summarize their remarks and keep them within the 10 minutes, this would allow time to ask some questions.

Also, we would like to advise people it's quite possible we'll be asking additional questions later for the record, and so if you'd be responsive in a fairly quick manner to those additional written questions that might come forth from the committee, that would be appreciated.

So with that, Mr. Cantrell, we welcome you again before the committee and would be receptive to any opening remarks that you might wish to make.

STATEMENT OF P. THOMAS CANTRELL, DEPUTY ASSISTANT SECRETARY FOR SENATE LIAISON, DEPARTMENT OF ENERGY

Mr. CANTRELL. Thank you, Senator Nickles, I appreciate it. I'd like to begin by associating myself with your opening remarks of the importance of bringing these hearings to Oklahoma outside the Potomac River syndrome of Washington, D.C.

You're to be congratulated for having insisted upon having these hearings with the Senate Committee on Energy and Natural Resources. It's very, very important that we do, in fact, come out into the field and hear from the people who have the expertise in it.

It is an honor to be here today, as well as yesterday in Tulsa, to be able to represent the administration's proposal, to answer questions and discuss President Reagan's attempt and Secretary Hodel's attempt at this most important issue of deregulation. More importantly, it will be an honor to stay and also hear along with you what other witnesses and what other testimony will be discussed today.

As you know, this proposal, our proposal is just that, it's a proposal. It's a suggestion. It's an idea. It is subject to the legislative process, the give and take within certain principles. We feel that the proposal we have given is the basic framework whereby we can move toward the deregulation of natural gas.

We feel very strongly that section 104 gas must be deregulated by a time certain. We feel very strongly about the dates that are in the bill. We feel very strongly about certain principles of the consumer protection aspect, the incentive to renegotiate contracts, and outside of that, we would hope that we would be able to arrive at the proper language and agreed upon language with Congress and that the President can sign a bill into law.

S. 615, which is the Senate version of the Natural Gas Consumer Regulatory Reform Act of 1983, is a comprehensive attempt to bring us out of the dark ages of government regulation into a market system through a rational transition period.

The purpose of the administration's proposal is to assure that we have adequate supplies of natural gas at a reasonable price. Our 5 years' experience has proven with NGPA that it just isn't working. Prices are rising rapidly despite lower demand and plentiful supplies. Pipelines and producers are locked into contracts that require payment for specified amounts of gas regardless of whether that gas can be sold to pipeline customers, and gas that is expensive to produce is being brought to the market while lower cost supplies are being shut in.

I was struck to hear when Secretary Hodel was testifying on March 9 before your committee that one of your colleagues made the comment that this proves that the market system hasn't worked, implying that what we need is some more Government control to rectify the situation, and nothing could be further from the truth.

We have neither had a free market in the natural gas issue nor do we need more Government regulation to help solve the problem. What we need is a rational approach to move us from the present market regulated situation to a free market discipline. That is the principle of the administration's proposal.

There are three specific principles; one, freedom for producers, suppliers and distributors to negotiate new contracts which would be allowed to operate on their own terms free of Government regulation, free of Government coercion, free of Government scare tactics; two, elimination of disincentives to produce and sell low cost gas, and, three, that there be a high degree of consumer protection.

Let me begin by discussing the aspects of the consumer protection. The administration's proposal contains two important provisions to protect the consumers against unreasonable price increases. One, pipelines will be prohibited from immediately passing through to customers any increase in their cost to purchase gas other than those attributable to inflation. Two, a gas price cap will be established on the basis of the volume-weighted average price of gas purchased through contracts that are newly executed or renegotiated after enactment of the legislation.

Prices under existing contracts that are not renegotiated will be limited to the present NGPA price ceiling or the price gas cap, whichever is lower. The exception to this will be so-called section 107 gas, which is deep gas, which will, in fact, not be roped into a price cap category but will be frozen at the highest price that has been received for that gas prior to enactment of the legislation. This cap applies until 1986.

A principal to encourage renegotiation of contracts in the administration's bill realizes that in today's market pipeline companies are bound by owners' contract terms that tie prices to inflexible regulatory ceilings that keep rising, and by provisions that require payment for specified amounts of gas regardless of whether the gas can be sold to customers, so-called take or pay.

The administration's proposal permits contracts to be negotiated, or renegotiated on whatever terms the parties agree to, and thus be free of any futrher Federal Government regulation. This will allow producers, pipelines, distributors, and customers to respond to market conditions, including the present downward price pressures.

If there has been no renegotiation of a preenactment contract by January 1, 1985, either party may, and I repeat, may—it is not mandatory—either party may abrogate such contract. This market-out provision is the largest incentive for renegotiating present contracts.

And finally, we wish to eliminate disincentives to buy and sell the lowest cost gas first. Our proposal will eliminate this incentive by, one, allowing the take or pay requirements mentioned earlier to be reduced at the option of the pipeline to 70 percent of the required amount, thus giving pipelines freedom to go out, search, and contract for lower priced gas. It will also allow producers to sell to any willing buyer the amount of gas removed from the take or pay provision, and requiring that such gas be transported by the refusing pipeline at an incentive rate. This is the so-called contract carrier provision.

We feel also in our proposal that we would remove the Fuel Use Act and the incremental pricing restrictions that have encouraged industrial users to switch to other fuels and thus leaving residential customers to bear a larger and larger share of the fixed cost of the gas supply system.

And we wish to eliminate controls on the price of old gas, which cause supplies to be shut-in and lost forever to the market and thus deny the consumers the benefit, and I repeat, the benefit of low cost resources moving in to the gas system.

The effects of our proposal we believe, compared to current law, the administration's proposal will result in an estimated reduction of at least $7 billion in consumer costs through 1990.

Under current market conditions and using very conservative assumptions about oil prices, we estimate that our proposal will result in a first year average price decrease of between 10 cents per thousand cubic feet and 30 cents per thousand cubic feet of natural gas.

This should be compared to prices that are 20 cents per thousand cubic feet to 40 cents per thousand cubic feet lower than prices that will occur if the current NGA price is continued.

Inflation will be benefited by the administration's proposal by a small amount, both directly, by reduced costs to the homeowners, as well as indirectly, by the reduced costs of producing gas where natural gas is used, for example, bread. Increased supplies and lower cost prices resulting from the administration's proposal will cause gas to compete more effectively with oil. We therefore estimate, in addition, that oil imports will fall below current projections of imports by from 100,000 to 200,000 barrels per day.

Finally, our proposal will encourage production of lower-cost supplies before higher-cost supplies are produced. This results in a positive conservation and a more efficient allocation of this Nation's valuable resource, natural gas.

It should be remembered that even though the price per Mcf under our proposal we feel strongly will decrease, this does not guarantee that the total gas bill to consumers next winter will go down. We had a very mild winter this winter and there is probably no scenario that can be developed, where under a more severe winter gas bills will drop. The people may have to be paying more for the total natural gas usage because of the amount of their usage even with unit costs down.

Passage of this legislation will not be easy. The administration stands ready to work with you, Senator Nickles, and the rest of Congress for its passage. We are not coming to you, the committe, the Congress or the American people with a take-it-or-leave-it attitude, and that's why I am here today with you to hear the testimony in a spirit of good-faith effort, to solve this tremendous national dilemma.

I am happy to answer any further questions that you may have. I again congratulate you, look forward to hearing the testimony of the other witnesses, and answering questions that you may have.

Senator NICKLES. Thank you very much, Mr. Cantrell. I will likewise say I am very appreciative of the interest which you've shown, and also the Secretary of Energy has shown for an attitude of cooperation and willingness to discuss various aspects of the piece of legislation, and willingness also to see if some improvements can be made, and seeing if we can't come up with a good, viable, workable piece of legislation that would move or accelerate the effort towards decontrol.

You know, there are a lot of critics in Washington, D.C., there are a lot of critics nationwide, I guess that, say decontrol will certainly increase the price of natural gas. You stated in your statement that it your statement that it would not increase the price of gas as would NGPA. Under NGPA, prices have been increasing substantially for consumers. So could you compare for us or maybe give us a couple of reasons why you think natural gas prices will be increasing less under a decontrolled posture as compared to under the present law under NGPA?

Mr. CANTRELL. NGPA was specifically designed to try to increase supply of gas, and, therefore, it had released controls on certain kinds of expensive gas to produce. It then established what they considered at the time ceilings, and as we all know, they quickly become floors by Federal regulation of the price of the rest of the gas that's in the market.

Therefore, the incentive that was established under NGPA has caused the average price of gas to go up, while the higher and higher cost gas is being brought in more and more into the system, and the inexpensive gas which now cannot be sold in the interstate or intrastate market will be shut in. You're moving the average price higher and higher.

If, in fact, our legislation is adopted as we proposed it, we believe there will then be a tremendous amount of what's called a cushion, gas cushion, 104 gas brought in that otherwise will be shut in. It will cause the average price to be brought down, so that the average price that the consumer will be paying will be less than it would be if, in fact, we moved more and more to higher cost gas. That is our strong belief.

In order to guarantee that the consumer does not incur any risk in this particular transition period, we have asked that no longer will there be any passthrough of purchase gas adjustments except for that which is accountable for inflation, without a public proceeding with FERC—Federal Energy Regulatory Commission—and in fact we will implement a market price average, the gas cap, which will be applied to those remaining categories of gas that are still under contract, and it will be charged the lower of either the gas cap or the NGPA price, whichever is lower.

Therefore, it is not possible for prices under our legislation during this transition period to, in fact, go up beyond what we have said, unless there is compelling and very evident information that the Federal Energy Regulatory Commission would have to rule on.

Senator NICKLES. Do you see any parallels between those who are totally opposed to any type of decontrol legislation and those who oppose decontrol of oil?

Mr. CONTRELL. The parallels are very strong. We are hearing from the same sectors in Washington who were very much opposed to President Reagan's decontrol of oil the same sort of projections of what will happen when we decontrol gas.

As it turned out, those projections were totally wrong on the decontrol of oil. Gasoline did not go to $2 a gallon. The market did take hold. Consumers did respond with an elasticity of demand of oil prices, and they are now consequently coming down and the economy is benefiting.

We feel the same parallel will occur with the natural gas. The parallel couldn't be any closer; it couldn't be any stronger. The two products are in a sense interchangeable. It is without question in our mind that the same consequences will occur, that we will find the average price of natural gas going down under a deregulation scenario.

Senator NICKLES. Natural gas is what, about the only major—certainly the major—the only major energy commodity that's controlled at the production point, and I can't think of any other natural resource, period, that is controlled.

Is there any other natural resource that is controlled?

Mr. CANTRELL. To my knowledge, there is not. I continue to use that phrase sort of timidly expecting someone to come forth and give me an example of one that is still that I've forgotten about. I've said it many times and no one ever has.

I am more and more confident that, in fact, it is the only commodity at the production level that the Federal Government continues to regulate, and why then we're surprised that there are either shortages as there were in the late seventies or increasing prices at a time when we have an oversupply as we have today should not come as a surprise to anyone under this scenario of Government regulating it. Government will always be off what the market conditions would say would be the proper price and supply of gas.

Senator NICKLES. Isn't it also true in natural gas that we have regulated prices of gas, and I mentioned the 28 different categories, and we also have 107 or the high price which has been deregulated since passage of the act, hasn't it, in effect, actually been decreasing substantially because the market forces have worked?

In other words, all the price-controlled categories of gas have continued to escalate in cost except for the one category of gas that's deregulated, and, in effect, its price has been coming down and coming down substantially in the last year.

Mr. CANTRELL. That's absolutely correct. The information we have been receiving, that by now people who were anticipating $9 or $10 per thousand cubic foot on some deeper type gas are now very pleased that they're able to sell it at $3 to $4 per thousand cubic foot.

Senator NICKLES. One additional comment, and certainly I'll compliment the administration for parts of their bill, particularly the part that says any new contract be totally deregulated; is that correct.

Mr. CANTRELL. That's correct.

Senator NICKLES. If a new contract between purchaser and the buyer, if they enter into a new contract, it's deregulated upon its completion. If a contract is renegotiated, it's totally deregulated upon the time that it's renegotiated. Certainly I'll compliment you for calling for repeal of the Fuel Use Act. I have introduced legislation to do so, and I think that law has certainly inhibited the sales of natural gas, because since we couldn't sell to either utilities or industrial consumers, residential consumers have to bear the greater brunt of fixed costs of the pipelines. I certainly commend you on those aspects. One question, though.

In your statement, you mentioned the gas cap would be reflecting the market price. As you know and as I've stated to you in the past, I am concerned about the gas cap not reflecting the market price, but quite possibly if you had the way the present definition of gas cap is, and correct me if I am wrong, the gas cap would be comprised of any new contracts and also any renegotiated contracts on a weighted average, and if you renegotiated on a substantial volume a lot of old gas contracts, it may well—they may well come in quite less than the market price. Conversely, you might renegotiate a 107 contract or a deep gas or uncontrolled contract and it may come in well above the market price even at renegotiation, it's possible, and if you put the weighted average between the two, as we've heard some individuals testify yesterday and also in Washington, D.C., it is quite possible that you could come up with a gas cap that would be substantially less than market. The bill says you would charge NGPA price or the gas cap, whichever's less, and you might, in effect, be telling somebody, "yes, you have a contract a valid contract today that you're selling gas at $3.20 and then tomorrow the gas cap may come in at $2.50" and you're substantially putting—that person or company or group of individual royalty owners, et cetera, in quite a bind.

So would you be receptive or work with us in possibly a redefinition or considering changing the gas cap limitation to maybe more of really targeting in on market price conditions, possibly new contracts or some variation of that?

Mr. CANTRELL. Senator, first of all, let me say that, as I have mentioned previously, your concern about how the gas cap is figured has not been lost upon the administration as you have made it very clear, your concern about the way the gas cap is being figured.

To answer your question, yes, we are always receptive to further analysis to trying to figure out through the legislative process what is in the best interest of the Nation as we move to decontrol. So we're more than happy and more than receptive to further analysis and discussion on the gas cap as well as other aspects of the bill.

Senator NICKLES. Let me just make one additional comment and not so much in the form of a question. I think there was some very good testimony that was made yesterday about the stabilizing impact of not abrogating contracts, and under the current bill, correct me if I am wrong, but it didn't mandate the contracts would be abrogated by January 1, 1985, but it basically said that by January 1, 1985, one party could opt out and they had a window of 1 year to opt out of that contract.

I think there was some—and I look forward to hearing some of the other individuals testify on this issue, but I think some good testimony came from some of the persons that were involved.

Some said it would be quite to their advantage to have that one person opt out because they had large volumes of old gas, but they still felt like the sanctity of contracts should take precedence over that and that you shouldn't have a one-party out in this 1-year period of time. They also made, I think a fairly good argument that this would help stabilize, over this period of time that many have talked about, the gas cost because the terms of the contracts would in many cases well exceed past 1986 or 1987 or whatnot.

Do you have any comments on that or would you be receptive in working with some of us that might lean a lot stronger to have, really, a philosophical problem with having a legislative mandate or market-out provision?

Mr. CANTRELL. Let me comment about that, Senator, thank you, because I want to first of all emphasize the fact that the entire process by which we developed this piece of legislation and in every phase and every step of the way, this was probably the most troublesome problem that the Reagan administration had.

It is not the desire or the will of the administration in any way to be so involved in the market that in fact we would be mandating abrogation of contracts. We were very careful to say that we are not abrogating contracts. The Federal Government is not abrogating a contract. That in fact we are allowing the parties who negotiated a contract under a completely federally regulated environment to have a transition period to see what would be—if this contract would still be in their best interest or if an additional contract would be in their best interest when they move then to an open market and a free market system.

We feel that there must be some protection, some aspect, some caps or some involvement of Federal protection during this period of time while all the parties of these contracts move from a regulated to a nonregulated environment.

It was not an easy choice. It is still not an easy choice, but I want to emphasize the fact that the word is that the parties, at their option, the parties have that responsibility. The Federal Government under our proposal is not going in and saying that this is the way contracts will be from now on.

Now, there are some other pieces of legislation that have been introduced which do in fact come in and say this is the way the contracts will be from now on, and I want it clear that the administration does not feel that that is the proper approach, that in fact we wish to give the parties their decision, their time to decide about renegotiating these contracts.

It is without question the major incentive whereby parties to contracts will go out and look to discover and find, when you couple that with the PGA limitation of passthrough, go out and find the lower cost gas, bring that lower cost gas into the market that otherwise would have been shut in, and that was the deciding factor and the deciding motivation for us to put that particular aspect in the legislation.

Senator NICKLES. One final question and it's again one that I've raised on a couple of occasions, but the administration's bill as presently written does not deal with the cost involved with imported gas or LNG.

It seems to me to be wrong—I am not one that really wants to control or abrogate or interfere with contracts entered into with other countries, but again, and I guess somewhat comparing it to the windfall profits tax, it seems ridiculous to have domestic production under any type of price control and not to have imports under some type of control. I know that you're aware that were looking at contracts for Algerian natural gas, LNG at $7.13 per Mcf, and we're looking at

Canadian gas at $4.94 and Mexican gas at $4.94. That's hard for me to fathom when we see domestic production in Oklahoma, Texas, and Louisiana that's shut in and we can't sell for $1.50.

So I think that both the Congress and the administration need to address the import situation to make sure that we don't put our domestic producers at any disadvantage. I am not trying to put imports at a disadvantage as compared to domestic, but certainly there should be equality to where we don't actually encourage imports, give them a market that we're not even allowing our domestic industry.

Mr. **Cantrell.** I would like to draw the parallel a little further perhaps with the decontrol of oil. As you know, President Reagan's decision to decontrol the domestic price of petroleum had nothing to do with and no impact upon whatever contracts, agreements there were between parties importing petroleum.

What happened is the market in this country took hold of that pricing situation and caused the importation prices to, in fact, begin to reflect more what the market will accept in this country.

We feel the exact same thing will happen with natural gas, that, in fact, foreign importers of gas that are far above market clearing price will, in fact, when we decontrol, allow the market to take hold in this country, will, in fact, have to reflect those market conditions, that they will not be able to continue to charge exorbitantly high prices that were far above market clearing price entered into at a time when people felt like there was never going to be gas down the line at this point, and a supply at any price would be worth it.

As you know, we are talking with the Canadians, with other importers to this country of gas, negotiating with them. We feel strongly if they come to the realization they want to continue to be a player in this market, they're going to have to do so under the terms of market conditions, and those are not reflected in some of the recent contracts that have been discussed. Canadian ministers have made the prediction that they wish to continue to account for a certain percentage of our market.

If we decontrol the price of domestic gas, they will not be able to have that. They will not be able to accomplish that objective unless their prices reflect what the market conditions in this country are.

We feel very strongly that without them getting involved in international questions and international problems, that we simply do what we did with domestic oil, decontrol it and force importers to be more reflective of what the American market conditions are.

Senator **Nickles.** I raised that point—and I appreciate your response. I raised that point to kind of illustrate that's present policy under NGPA. When price controls are mandated, very low prices on other gas and other gas in Oklahoma, you're actually—by limiting those prices, you're actually limiting and subsidizing the importation of higher cost imported gas, and particularly when you see the amount of subsidies that are in these import prices, this $4.94 and $7 and so on are great subsidies to these governments. It seems ridiculous for us to penalize domestic production—deny that money in domestic use, jobs, taxes, et cetera, to be indirectly subsidizing those foreign governments, and that's exactly what present policy under NGPA has been doing and that needs to be addressed. I agree with you the best way to address it is total decontrol, and the market will take care of it.

Mr. Cantrell, thank you very much for your input again, and also I am appreciative of the fact that you've said that you're going to be listening and you'll also be available for the better part of the day to visit with other individuals that may wish to discuss particular concerns. I think that's commendable.

Many times when we have administration witnesses, they drop in on a hearing, they say their two bits and then they're gone, and you really don't have a whole lot of chance to have some input, and I noticed yesterday that you were very attentive throughout the day of hearings that we had in Tulsa and I appreciate your commitment to that and also for our hearings in Oklahoma City.

Mr. CANTRELL. Thank you, Senator. I appreciate that, and again I want to congratulate you. I can't emphasize enough how important it is to bring these kinds of hearings out beyond the Potomac River to where we can, in fact, get this kind of expertise, and I know you fought very hard to do this and you should be congratulated, and I appreciate the opportunity not only to be here to testify but, again, to listen an hear some more and take some notes and see how we can go back to Washington and work out a better bill.

Senator NICKLES. Thank you very much. On our next panel we have Clyde Madden, who is from Oklahoma City; Tom Lucas, representing the National Association of Royalty Owners from Ada; Frank Lewis with Frank Lewis and Associates from Del City; and also Bonita Hoeme?

Ms. HOEME. Hoeme.

Senator NICKLES. Haney.

Ms. HOEME. H-o-e-m-e.

Senator NICKLES. From Texas County, panhandle country. Mr. Madden, do you care to be first? If you don't mind pulling the microphone over so other people can hear what you have to say.

STATEMENT OF CLYDE MADDEN, OKLAHOMA CITY, OKLA.

Mr. MADDEN. Thank you, Senator Nickles, ladies and gentlemen. First, Senator Nickles, I'd like to thank you for inviting us here to be witnesses before the Energy and Natural Resources Committee of which you are a member. I must congratulate you. Last time I spoke when Senator Boren had a hearing on social security at the State Capitol and I tried to give some input on that.

I favor deregulation of gas, but also I favor lowering the price, roll back the prices. Because of unemployment, Senator Nickles, it's been hard to sell the gas.

I've talked with my office this morning in Louisiana and it has been hard to sell because of the price, the demand hasn't been that great because of unemployment and it would roll back the price, and I think that should be included in the bill.

Also, I favor import controls, so I don't think that our domestic people should have a better—don't give it all to the importers like you were saying a while ago. So I favor deregulation, but also the rollback of prices so we can sell again. We've got a lot of gas in Louisiana, and I think by deregulating it, rolling back the price and creating more jobs, cutting down unemployment, I think deregulation would work then.

Senator NICKLES. Thank you very much, Mr. Madden.

Mr. Lucas.

STATEMENT OF TOM M. LUCAS, CHAIRMAN, NATIONAL ASSOCIATION OF ROYALTY OWNERS

Mr. LUCAS. My name is Tom M. Lucas. I serve as chairman of the National Association of Royalty Owners and I am an assistant to J. D. Hodges of Woodward, Okla., who is an oil and gas—independent oil and gas producer.

The National Association of Royalty Owners is headquartered in Ada, Okla. It serves over 38,500 direct members and members of regional and state mineral and surface owners associations that have affiliated with our association. We now have members in all 50 States.

We were formed in 1980 in opposition to the windfall profits tax on oil, and since, we have become active in protecting the rights of mineral and royalty owners in several additional areas at both the State and Federal levels. Our studies show there are 1.3 million natural gas royalty owners in the Nation, that their average age is above 60 and their royalty incomes from natural gas production is less than $250 per month. It is a supplement to the social security checks for many.

The National Association of Royalty Owners commends the administration on the intent of the proposals brought forth to amend the Natural Gas Policy Act of 1978 and to repeal the Powerplant and Industrial Fuel Use Act of 1978. We thank you, Senator Nickles, for conducting this hearing to receive public comments.

I wish to reiterate, initially, that while our association is commenting on the proposals as given, NARO remains steadfast in its feeling that the NGPA must be repealed and that total and complete decontrol of natural gas must occur. We view the proposed amendments as much less than complete decontrol. The position of NARO and the discussion that follows will lead to these three points:

One, NARO fully supports the repeal of the Powerplant and Industrial Fuel Use Act of 1978. NARO strongly objects to the price controls contained in the proposed amendments. NARO has qualified support for some of the other parts of the proposed amendments.

First, one of NARO's primary goals over the past 3 years has been to work for the repeal of the Powerplant and Industrial Fuel Use Act of 1978. NARO fully and completely supports the repeal of this act. The negative impact that has occurred to the natural gas industry because of the implementation of the provisions of the Fuel Use Act have been nothing short of disastrous. I would like to cite a local example that is typical of what has occurred across the Nation.

A rural electric cooperative in western Oklahoma serves five counties, and prior to the Fuel Use Act, purchased power from a plant in the area which used water and natural gas, purchased locally, to generate power. Because the Fuel Use Act, as passed, required conversion to coal generation and because it was impractical for conversion of this plant, the cooperative joined with other cooperatives in the construction of the coal-fired power generating plant in eastern Oklahoma, over 300 miles from the cooperative's headquarters soon after the passage of the act.

Then in 1980 the act was amended to allow plants using natural gas to continue as natural gas plants through the life of the plant. The damage was already done. The decision to invest in a coal-fired generating plant had already been made, and it was too late to back out. The result has been an 80-percent increase in prices to the consumer over the past 12 months because of the costs associated with the recovery of the plant investment, which is over a 35-year period.

True, the actual cost of the power being generated is less, but because of the plant investment, both the consumer and the cooperative are hurt in the process. The cooperative is locked in a high rate of interest which will be passed on to the consumer for a long time to come.

Since part of the issue is consumer protection and since this whole episode was caused by the Government anyway, perhaps rolling back the interest rate through the Federal Financing Board in these kinds of cases to allow reduction in rates to the consumer might be in order.

There are 17 other major points contained in the proposed amendments. Rather than taking each of the 17 points, NARO will discuss its objections to parts of the bill and its qualified support of other parts.

First, we need to recognize that the oil and gas industry in America is sick. All segments of the industry are losing money with no end in sight. The industry is sick because of the state of the economy and it is sick because of improper legislation in effect. NARO is opposed to any legislation which will adversely affect the oil and gas industry under the guise of consumer protection, particularly if that legislation purports to protect the consumer when, in fact, its implementation would not have that effect.

The administration and the Congress must realize that economic investments and decisions have been made based on present laws and provisions have to be made to protect those who have made those economic investments based on current law.

The drafting and passage of the NGPA was based on the theory that there were always going to be shortages of natural gas. The drafters of the NGPA underestimated the ability of American business to respond so quickly by discovering and developing America's natural gas reserves.

One of the aims of the NGPA was to assist the country in its goal of energy independence, consequently, it restricted the use of gas by industry and by utility. While it created some incentives for the development of natural gas reserves, it also restricted future demand for natural gas.

The proposed amendments have the effect of placing a ceiling, in reality, a freeze on the price that will be paid by the pipeline purchasing companies to producers of natural gas based on the national average price, which is believed to be in the vicinity of $2.50 at this time. The effect will be that exploration for natural gas will slow even further and come to a standstill until after the amendments expire, decontrol occurs and the necessary time passes to allow for the supply and demand to seek a predictable price level.

Price controls on any commodity have never worked in the long run and often not in the short run, and neither will these. Price increases at the wellhead represent only a fraction of the price increases that are passed on to the consumer and end user. The price controls that now exist in the NGPA have not worked and are largely responsible for the chaotic condition that exists in the natural gas industry.

Price controls reduce production. They cause the producer to be unable to protect himself against increasing costs, and the ultimate result is shortages. Shortages are then followed by the reatcion of the Government by releasing the price controls, followed by rapid inflation in the prices and disaster to the consumer.

Time and time again, history has proven that price controls are adverse to the consumer. At this very moment, we are on our way to natural gas shortages. At best we only have a 20-percent surplus. Natural gas reserve declined 7 percent last year and have declined in 12 of the last 14 years.

Wells now in production are averaging a 14- to 17-percent decline each year and exploration is off over 50 percent. This is occurring because of the pricing provisions of the NGPA and the effect of the Fuel Use Act. The gas cap and the ceiling provisions in the proposed amendments will do nothing other than add to this situation.

The situation is complicated by the fact that NGA regulates most of the gas by price but does not regulate it all. By not regulating deep-gas prices through the NGPA, the Government encouraged exploration for deep-gas reserves. However, deep-gas reserves have still had to be sold within what, in essence, is a regulated market.

Prices presently paid by pipeline purchasing companies for unregulated deep gas are governed by the amount of low-cost regulated gas reserves that they have available to them. Pipelines with large amounts of low-cost gas available to them can pay more for unregulated gas while the opposite is true for pipeline purchasing companies with small amounts of low-cost gas reserves.

The proposed amendments would do nothing to change that, but would cause companies with low-cost gas to increase takes from these wells, reduce takes from high-cost gas wells and not purchase any additional high-cost gas. This penalizes those producers who took the NGPA at its word and explored for deep gas, many of whom are now the owners of high-cost, shut-in wells that have neither a pipeline connection or a gas contract.

If the proposed amendment pass as written, the Government is in fact saying: "Tough, you now have no chance to recover your investment." Are we prepared to let producers stand the billions of dollars that they would lose because they relied on the word of the NGPA and invested in deep gas wells?

In addition, you must realize that 80 percent of new gas reserves are discovered by independents and these proposed amendments will destroy their ability to raise drilling funds.

The producers of high-cost, deep gas have had to insist on take-or-pay clauses to provide a more reasonable assurance of recovery of their investment. Take-or-pay clauses—they are really take-or-prepay clauses—have been necessary and are still necessary, but they have added to the complexity of the pricing problem.

With falling demand, pipeline companies first cancel takes from low-cost gas, not subject to take-or-pay, then lower cost gas subject to take-or-pay, and on down the line. Wells are shut in, which makes the average price rise and then the consumer uses less.

Pipeline purchasing companies have been allowed to roll in prepayments in their rate base plus a rate of return until either the gas is made up or the prepayment period expires. Consequently, consumers can be paying for gas that may not be able to be sold. The answer lies not in Government reduction of take-or-pay clauses, but in the producers and purchasers renegotiating their contracts on their own doing in whatever ways will work for both of them.

NARO has support for provisions which would allow buyers equal access to offshore and interstate gas and for the provision which would permit pipelines to carry gas from the producer to the purchaser at an incentive rate, provided that we do not head in the direction of nationalization of public utilities that we are hearing so much discussion about.

NARO believes, in reality, there is no competitive market for natural gas. It is principally a captive situation in which producers have little say over the price they will receive for their production. NARO believes that few, if any, contracts between purchasers and producers will ever be negotiated higher on old categories, unless free market access through awarding common carrier status to pipelines is considered.

It should be pointed out that old gas represents 40 to 60 percent of the total volume, but old gas applies to 70 percent of the gas royalty owners in the Nation.

Twenty-five percent of the NARO members surveyed indicated they were subject to prices well below 50 cents per Mcf. The average age of these people is over 65 with the largest cluster falling between 70 and 73. These people are for the most part retired and dependent upon their small royalty income for survival in addition to their social security benefits. Not only will decontrol, repeal of the Fuel Use Act and free market access benefit them, it will benefit the industry and the consumer as well.

Senator NICKLES. Thank you very much, Mr. Lucas.

Mr. Lewis.

STATEMENT OF FRANK W. LEWIS, FRANK W. LEWIS & ASSOCIATES

Mr. LEWIS. Thank you. I appreciate the opportunity to express to you my views and concerns about the effects of rapidly rising natural gas prices in Oklahoma and their effects across the Nation. As a petroleum economist, I am particularly interested in the effects on price and consumption, but concurrently, as a consultant to independent producers on regulatory matters. I am also interested in the results of the regulatory and pricing decisions made by the Federal Government under the Natural Gas Policy Act and the Natural Gas Act.

Many people in the energy industry speak for diverse groups and I am no exception. Before I express my concerns and suggestions for possible future actions, I would like to describe my clientele. My clients are primarily small independent producers who, although they may own working interests in natural gas produced below 15,000 feet, are not operators of those wells. Typically, with few exceptions, they invest in and operate gas properties of 12,000 feet or less.

So when I speak, I am addressing their common concerns and the problems they face in the changing economic and regulatory market.

However, the statements which I make are mine entirely and reflect solely my personal point of view. I am not being paid to present testimony and am doing so to give you another view of the problems affecting the natural gas industry.

Even with these caveats, it does not take a great seer to determine that the natural gas industry is in severe difficulty. Sales are decreasing even in time of seasonal peak demand and industries are switching to alternative fuels. Conversations among producers center on "how much of your production is shut in" and "I can't get a contract."

Even within the industry, there is division. Some groups want immediate decontrol and others prefer to follow the existing decontrol schedule of the NGPA. However, all producers want changes in the existing framework of natural gas regulation, that is, these changes would result in increased consumption.

The primary problem affecting our industry is high prices. High prices calls alternative fuels to be used in base load industrial plants. High residential prices cause consumer unrest and attract politicians with quick fixes, which are neither quick nor permanent fixes. High prices along with imprudent regulation have caused the industry to see its market share decrease.

Unfortunately, the industry, itself, is not without blame in creating the high prices it now finds so damaging. Both producers and pipelines willingly agreed to contracts with the high prices for deep natural gas. In addition, in their urgency to gather needed supplies, both pipelines and producers agreed to take or pay contract provisions which now guarantee that high prices will continue even as new natural gas prices drop at the wellhead.

To illustrate my point about high prices, I have included two tables for your examination. First, in appendix A, are the most recent 26 months of casinghead and natural gas prices for the State of Oklahoma. This data was gathered at the Oklahoma Tax Commission Gross Production Division from public records and represents average wellhead prices on a statewide basis.

A brief perusal of this data reveals two salient points. For both casinghead gas and natural gas, consumption is clearly decreasing as prices are increasing. If I can make one point during this presentation, it is demonstrated by this table. In a relatively free market in which substitutes are available, if prices increase, consumption is going to decrease, and if prices decrease, consumption will increase, and that's a primary problem facing the natural gas industry today. These are the basic laws of economics. Despite regulation, those laws will apply. It is free market economic theory at its best.

Much has been written and said in an effort to disguise or modify these principles, but in my view the problems in the natural gas industry primarily are the result of higher prices causing lower consumption. Conversely, lower prices will result in higher consumption.

However, my purpose in this presentation is not to outline the problems of the natural gas industry but to propose solutions. Toward that end, I would propose three steps which I believe would restore price and production stability to the industry.

First, require all pipelines, regardless of interstate or intrastate status, to be common carriers. The Federal regulations should be amended to encourage and not impede any transportation of natural gas through any exchange or transportation agreement. It should not matter whether a pipeline is transporting natural gas it owns or natural gas owned by another party. Pipelines should be accessible to all, subject only to the limits of their capacity. In return, the pipelines should be able to charge for these services.

To illustrate the importance of this point, the following table illustrates the price difference between current prices of natural gas in Texas and Oklahoma. Suffice it to say that a typical 102 well in Texas is selling for 13 cents a btu more than a typical well in Oklahoma as of February 1983, and in 103, the difference is even greater; it's 45 cents.

These higher prices illustrate that additional markets are available for Oklahoma natural gas if the gas could be readily transported. However, I was told by one pipeline when I stated that I had some $2.00 gas in Oklahoma that I wanted to sell out of State, "We don't transport other people's gas because of the red tape." I don't know if red tape is the only problem, but the table clearly illustrates that other markets for Oklahoma natural gas are available. I have summarized in the following tables the sources and limitations for the data selection.

NEW NATURAL GAS PRICES IN DOLLARS PER MILLION BTU

February 1983

NGPA section	Texas	Oklahoma
102	3. 468	3. 330
103	2. 899	2. 439

Second, I would decontrol all natural gas markets. Historically, price ceilings, even those escalating similar to the NGPA, have never, in the long run, equated supply with demand. If prices are set above the market clearing price, then shortages and rationing result. Both historically and recently, we can see aberrations caused by price and quantity regulations in many commodities.

Admittedly, older, lower priced gas would escalate to a market clearing price, but additional supplies of higher priced gas would also decrease to a more reasonable level. In this area, I favor President Reagan's plan to decontrol all natural gas and to require the pipelines to act as willing transporting agents.

As an additional point, I think that even without decontrol, some of the problems caused by high priced natural gas will diminish. I think we will see further market and economic outs until a more reasonable price is reached.

My one reservation with decontrol is the precedent establishing the Federal Government's right to abrogate existing contracts on an industrywide basis.

Some concern also exists as to what the market clearing prices would be under natural gas decontrol. Most offers to buy new natural gas in Oklahoma range from $2 to $2.75, assuming producers can get a contract. To give some further indication of the current levels of price in Oklahoma, I provided the following table.

OKLAHOMA FERC FORM 121 SUMMARIES

[Dollars per million Btu]

NGPA section	Dec. 1982	Jan. 1983	Feb. 1983
Oklahoma 102	2. 981	3. 217	3. 330
Maximum 102	3. 524	3. 551	3. 574
Oklahoma 103	2. 320	2. 534	2. 439
Maximum 103	2. 917	2. 930	2. 940

To summarize briefly, the maximum 102 rate for February 1983 is 3.574 cents, including tax reimbursement. The average 102 well filed with the Corporation Commission in that month was $3,330. For 103, the difference is even more outstanding. The maximum 103 rate for February 1983, including tax reimbursement, was $2,94. The average Oklahoma 103 price, including tax reimbursement, was $2.439.

It appears that recent Oklahoma demand is limited by transportation restrictions; however, I feel that the national market clearing price would be in the area of $2.50 to $3. I am against the concept of a gas cap, because first, if the market clearing price was above the set price, shortages would result. Second, and perhaps more importantly, the gas cap would provide a means for the Congress and the Federal bureaucracy to inevitably meddle with natural gas pricing.

Realistically, I do not believe that Congress will quickly decontrol natural gas. I believe that the Congress will continue the Natural Gas Policy Act until 1985 and abide by its schedule of decontrol. The natural gas industry has too many divergent views for it to sponsor a coherent plan on extricating itself from the current maze of Federal regulations.

One area in which I do believe that Congress will act is to end all restrictions on natural gas usage in industrial and commercial use. I fervently hope that they will end all the prohibitions against natural gas under the Power Plant and Industrial Fuel Use Act.

As one ending point, recent developments before the Oklahoma Corporation Commission may make all the controversy over take or pay provisions and shutin gas wells irrelevant. In the different cases, the Oklahoma Corporation Commission is being indirectly asked to authorize procedures which would reestablish the function of the State regulatory body to adjust supply and demand into equilibrium. In a role similar to that of the Texas Railroad Commission in the first portion of this century, the State regulatory commissions are de facto being asked to allocate supply among producers.

In three separate cases, divergent forces in the natural gas industry are asking the Commission to consider additional responsibilities. First, in a hearing before the Commission, the Commission staff argued that ONG's deep natural gas wells with $9 to $10 prices be reduced to a more reasonable level, and only then allowed into the rate base. The Commission held that insufficient notice had been given.

In a more recent case, Forest Oil Co. has asked the Commission to prohibit ONG from shutting in some of its deep gas wells on which Forest has an interest. Concurrently, ONG is asking the Commission to allow a procedure to allocate ratable takes throughout its system.

Both of these cases address the same issue. In times of oversupply whose gas get taken and by what standard is a primary problem that must be answered. If you do not have a free and competitive economic system, some regulatory agency must address this problem.

However, any conclusions that I may make in regards to the Commission's activities are mine. Based on my judgment of the Commission and speculation, I believe that the Commission will move in this direction.

Someone in the State of Oklahomas is going to have to allocate natural gas takes from the different categories of wells, and I believe the Commission is going to be the only authority that can do this.

To summarize my previous statements, I would address the single most important issue. First, natural gas a a viable fuel source must remain price competitive with alternative fuels.

If it is priced above alternative fuels, we will see further market share decreases, and that means we will have more problems with shutin wells. Natural gas is losing its market share. To recapture it, prices must go down. Thank you.

[Attachments to Mr. Lewis' statement follow:]

APPENDIX A

OKLAHOMA CORPORATION COMMISSION MONTHLY PRODUCTION SUMMARIES

	CASINGHEAD GAS			NATURAL GAS		
DATE	VOL. MM MCF	REVENUE $MM	PRICE $/MCF	VOL. MM MCF	REVENUE $MM	PRICE $/MCF
2/83	38.4	$ 87.3	2.278	119.7	$ 398.7	3.329
1/83	35.2	94.8	2.698	109.3	307.0	2.810
	73.5	$182.3	2.480	229.0	$ 705.8	3.081
12/82	35.5	$ 80.7	2.276	100.7	$ 322.3	3.199
11/82	34.8	78.1	2.246	104.1	326.0	3.132
10/82	35.7	79.5	2.225	118.4	413.2	3.490
9/82	44.5	74.5	1.677	112.3	319.9	2.849
8/82	35.1	76.5	2.177	116.7	337.3	2.890
7/82	37.9	80.2	2.117	120.1	329.8	2.746
6/82	39.0	99.9	2.560	133.3	491.0	3.683
5/82	34.4	76.6	2.217	130.8	343.6	2.627
4/82	29.8	63.0	2.114	134.9	344.3	2,553
3/82	26.9	72.9	1.977	151.1	366.1	2.424
2/82	50.2	77.3	1.540	135.9	481.3	3.541
1/82	35.1	70.9	2.022	137.7	294.1	2.137
	448.9	$930.5	2.073	1,496.0	$4,369.5	2.921
12/81	35.9	$ 72.1	2.009	148.3	$ 293.6	1.980
11/81	35.1	69.3	1.974	114.5	254.3	2.223
10/81	36.3	70.6	1.944	126.7	279.8	2.209
9/81	41.7	67.6	1.623	130.3	283.5	2.177
8/81	34.6	62.9	1.821	160.5	291.0	1.813
7/81	35.5	61.8	1.740	134.3	242.8	1.808
6/81	35.3	63.0	1.785	120.5	247.9	2.057
5/81	33.5	57.6	1.721	137.2	238.4	1.739
4/81	30.2	51.4	1.702	136.7	233.3	1.707
3/81	33.3	55.1	1.658	143.7	247.0	1.719
2/81	32.9	53.5	1.626	133.3	240.7	1.806
1/81	31.9	51.3	1.613	128.2	216.0	1.686
	416.2	$736.7	1.770	1614.0	$3,068.6	1.901

APPENDIX B

TEXAS NGPA FILINGS FOR FEBRUARY 1983

SECTION 102

Total Filings	386
Contract Base Price Shown	236
Sum of Base Price	761.161
Average of Base Price	3.225
Contract Total Price Shown	221
Sum of Contract Total Price	766.491
Average of Total Price	3.468

SECTION 103

Total Filings	425
Contract Base Price Shown	292
Sum of Base Price	796.665
Average of Base Price	2.728
Contract Total Price Shown	284
Sum of Contract Total Price	823.521
Average of Total Price	2.899

SECTION 107(T)

Total Filings	51
Contract Base Price Shown	47
Sum of Base Price	234.279
Average of Base Price	4.984
Contract Total Price Shown	46
Sum of Contract Total Price	243.309
Average of Total Price	5.289

SECTION 107(D)

Total Filings	2
Contract Base Price Shown	2
Sum of Base Price	8.629
Average of Base Price	4.315
Contract Total Price Shown	2
Sum of Contract Total Price	8.853
Average of Total Price	4.426

APPENDIX C

DATA SOURCES

All Oklahoma data were gathered at the Oklahoma Corporation Commission using the NGPA Applications for Determination. Sampling procedures were used to identify specific FERC Form 121's to examine. Prices were then taken from line 7D of the FERC 121's. Additional sampling data is available upon request.

Texas data is supplied by ENERPRO of Austin, Texas from the FERC 121's submitted to the Texas Railroad Commission for Jurisdictional Agency approval.

In both cases, the data represents prices submitted to FERC as contract prices and include tax and include all other allowed price adjustments when available. However, the validity of these prices depends upon the accuracy of the data entered upon the FERC 121 by the operator.

APPENDIX D

Natural Gas Policy Act of 1978
Maximum Lawful Prices
($/MMBTU)

Mo/Yr	102	103	106 blB	107 cl	107 c5	108	109	130% #2NY
12/78	2.078	1.969	1.121	2.078	na	2.224	1.630	na
1/79	2.096	1.980	1.128	2.096	na	2.243	1.639	na
2/79	2.116	1.993	1.136	2.116	na	2.264	1.650	na
3/79	2.136	2.006	1.144	2.136	na	2.285	1.661	na
4/79	2.156	2.019	1.152	2.156	na	2.306	1.672	na
5/79	2.177	2.033	1.160	2.177	na	2.329	1.684	na
6/79	2.198	2.047	1.168	2.198	na	2.352	1.696	na
7/79	2.220	2.062	1.176	2.220	4.124	2.375	1.708	na
8/79	2.244	2.079	1.185	2.244	4.158	2.400	1.722	na
9/79	2.268	2.096	1.195	2.268	4.192	2.426	1.736	na
10/79	2.292	2.113	1.205	2.292	4.226	2.452	1.750	na
11/79	2.314	2.128	1.213	na	4.256	2.475	1.762	na
12/79	2.336	2.143	1.221	na	4.286	2.499	1.774	na
1/80	2.358	2.158	1.229	na	4.316	2.523	1.786	7.170
2/80	2.381	2.173	1.238	na	4.346	2.548	1.799	7.260
3/80	2.404	2.188	1.247	na	4.376	2.573	1.812	7.410
4/80	2.428	2.204	1.256	na	4.408	2.598	1.825	7.110
5/80	2.453	2.221	1.266	na	4.442	2.625	1.839	7.380
6/80	2.478	2.238	1.276	na	4.476	2.652	1.853	8.040
7/80	2.504	2.255	1.286	na	4.510	2.680	1.867	7.840
8/80	2.532	2.274	1.297	na	4.548	2.710	1.883	7.380
9/80	2.560	2.293	1.308	na	4.586	2.740	1.899	7.400
10/80	2.588	2.312	1.319	na	4.624	2.770	1.915	7.400
11/80	2.614	2.329	1.329	na	4.658	2.798	1.929	7.450
12/80	2.640	2.346	1.339	na	4.692	2.826	1.943	7.580
1/81	2.667	2.363	1.349	na	4.726	2.855	1.957	7.610
2/81	2.698	2.384	1.361	na	4.768	2.888	1.975	7.760
3/81	2.729	2.406	1.373	na	4.812	2.922	1.993	8.260
4/81	2.761	2.428	1.385	na	4.856	2.956	2.011	9.010
5/81	2.787	2.444	1.394	na	4.888	2.984	2.024	9.510
6/81	2.813	2.460	1.403	na	4.920	3.012	2.037	9.430
7/81	2.840	2.476	1.412	na	4.952	3.041	2.050	9.360
8/81	2.863	2.488	1.419	na	4.976	3.066	2.060	9.260
9/81	2.886	2.501	1.426	na	5.002	3.091	2.070	8.860
10/81	2.909	2.514	1.433	na	5.028	3.116	2.080	8.700
11/81	2.940	2.533	1.444	na	5.066	3.149	2.096	8.930
12/81	2.971	2.552	1.455	na	5.104	3.183	2.112	8.990

Mo/Yr	102	103	106 blB	107 cl	107 c5	108	109	130% #2NY
1/82	3.003	2.572	1.466	na	5.144	3.217	2.128	9.180
2/82	3.033	2.590	1.476	na	5.180	3.249	2.143	9.340
3/82	3.063	2.608	1.486	na	5.216	3.281	2.158	9.470
4/82	3.093	2.626	1.496	na	5.252	3.314	2.173	9.340
5/82	3.112	2.634	1.501	na	5.268	3.335	2.180	9.280
6/82	3.132	2.642	1.506	na	5.284	3.356	2.187	8.000
7/82	3.152	2.650	1.511	na	5.300	3.377	2.194	8.170
8/82	3.176	2.662	1.518	na	5.324	3.403	2.204	8.670
9/82	3.200	2.674	1.525	na	5.348	3.429	2.214	8.660
10/82	3.224	2.686	1.532	na	5.372	3.455	2.224	8.950
11/82	3.249	2.698	1.539	na	5.396	3.481	2.234	8.640
12/82	3.274	2.710	1.546	na	5.420	3.508	2.244	8.890
1/83	3.299	2.722	1.553	na	5.444	3.535	2.254	9.420
2/83	3.321	2.732	1.559	na	5.464	3.559	2.262	9.320
3/83	3.344	2.742	1.565	na	5.484	3.583	2.270	na
4/83	3.367	2.752	1.571	na	5.504	3.607	2.278	na

Source: Federal Register, Tuesday, April 27, 1982, p. 17982
Ibid., Friday, July 30, 1982, p. 32935
Ibid., Thursday, October 28, 1982, p. 47809
Ibid., Thursday, January 27, 1983, p. 3720

Abbreviations:

102	New Natural Gas, Certain OCS Gas
103	New Onshore Production Wells
106blB	Alternative Maximum Lawful Price for Certain Intrastate Rollover Gas, Section 271.602(a)
107cl	High-cost (deep gas) Deregulated November 1, 1979
107c5	Gas Produced from Tight Formations, applies on or after July 16, 1979 Section 271.703, 271.204
108	Stripper Gas, not more than 60 MCF per day
109	Not Otherwise Covered
130%#2	130% of No. 2 Fuel Oil in New York City, threshold

Senator NICKLES. Thank you very much, Mr. Lewis.

Bonita Hoeme; is that correct?

STATEMENT OF BONITA C. HOEME, CHAIRMAN, WATER & ENERGY COMMITTEE, TEXAS COUNTY IRRIGATION AND WATER RESOURCES ASSOCIATION, INC.

Ms. HOEME. Yes, that's correct.

Senator Nickles, members of your staff: Thank you for conducting this public hearing so that we, your affected constituents and the fellow Oklahomans, may have the opportunity to appear and present testimony.

I am Bonita Hoeme, Rte. 1, Box 95, Guymon, Okla., chairman of the Water & Energy Committee of the Texas County Irrigation and Water Resources Association, Inc. Our association is composed of approximately 300 members; irrigation farmers and agribusiness people. It was formed 17 years ago to represent the economic and ecologic interests of irrigation.

There are just three quick points that I would like to make in regard to the effect of decontrol of natural gas as related to its impact on agriculture. These three points are such a miniscule part of the mind-boggling enormity of the whole question of decontrol, that it would be very easy for them to be overlooked, and as far as I am aware, they have been disregarded.

First, I want to emphasize the importance of irrigation to the food supplies of the Nation. Almost everything we enjoy eating has been irrigated; fruits, tomatoes, vegetables, and grains. Then the irrigated grain is used for meat and poultry production. In fact, every living thing eats grain.

Within a 100-mile radius of Guymon, we feed over 1 million head of cattle in numerous large capacity feedlots, turning the cattle into prime beef. Every feedlot that I know of uses corn in its ration, either corn for grain or corn for ensilage. We cannot grow corn in the Oklahoma Panhandle without irrigation nor could we produce a dependable supply of grain sorghum or alfalfa hay without irrigation.

Because of irrigation, farmers invest in large quantities of farm machinery, storage facilities, grain dryers, fertilizer, land leveling, pipelines and pay lots and lots of interest. All of this broadens the tax base and makes our area, once known as the Dust Bowl, one of the most productive in the world.

Our economy is entirely dependent upon our ability to continue to irrigate, and our ability to continue to irrigate is dependent upon our ability to continue to be able to purchase natural gas at a rate we can afford.

Incidentally, we are situated over the second largest gasfield on the planet Earth and the largest in the United States.

The second point I would like to make is that the area of acquisition and mineral ownership that relinquishes its own local resource, raw natural gas, for the benefit of others is duly entitled to special consideration and should not be treated the same as a nongas producing area.

Why? Because when we use natural gas at the wellhead on the farm or from nearby production gathering lines, there is no investment for the Pipeline Co. in compressor stations, tremendous pipelines, transportation costs and other expenses involved in taking our natural gas from Oklahoma Panhandle to the giant Northeast. We can use it on our farms just the way it comes from the ground.

Also, as surface owners of the land, we are burdened with pipelines, "drips," junction tie-ins, valves, rights-of-way, storage tanks, and many other facilities necessary for the use of the gas and oil industry. We also have to supply service roads for their convenience and they have the right of ingress, egress, and trespass on every acre of land.

Therefore, it seems only fair that gas purchasing landowners having to farm around their installations should not be viewed in exactly the same light as gas purchasers from nonproducing States and areas.

On most of the old leases, many of which are 50 years old, there is no payment for use of the surface. The landowner pays the ad valorem tax on the surface used by the mineral producer, and if the landowner is also a royalty owner, he also pays oneeighth of the "in-lieu-of" ad valorem tax on the personally owned assets of the producer for equipment on-situ, a tax which the landowner was not "lieu of" in the first place because he doesn't own that equipment.

Obviously, I am referring to the gross production tax, which by its very name indicates it should be paid by the producer who owns the equipment and not by the royalty owner, who does not own it.

The best means of repaying our area for its generous contribution of the raw natural resource and the accompanying inconvenience and hardship is to provide price protection for the cost of natural gas for irrigation and grain drying so that we may continue our farming operation and continue to feed the Nation and other countries.

Third, and in conclusion, because of the critical need to insulate such nonutility, nonresidential users from sudden sharp increases, we recommend development of a legislative rider that would freeze the price of natural gas for agricultural use, on farm wellhead; just talking about using it on the farm, gas from under that very land, on farm wellhead and gas production lines at costs not to exceed January 15, 1983 levels.

Offsetting adjustments would be allowed to producers to capture—recapture this loss of revenue as a passthrough item, depending upon the exact nature of any deregulation.

It has been reliably estimated that the on-farm gas consumption, limited to wellhead or production gathering line purchases—on-farm, is less than 1 percent of the Nation's gas usage. What a small price to pay for a reliable supply of premium quality food. The nature of the usage is, of course, primarily irrigation and grain drying.

We urgently plea that you will adopt our recommendation and pursue it to a successful conclusion so that we may continue to exist.

Thank you again for the opportunity to be heard.

Senator NICKLES. Thank you very much, Mrs. Hoeme, and we appreciate your contribution, and if you traveled from Guymon for your long—did you come in this morning?

Ms. HOEME. No.

Senator NICKLES. Last night?

Ms. HOEME. Yes. Thank you.

Senator NICKLES. Thank you for the long distance that you've traveled.

A couple of questions, I guess, and I'll just go down the panel.

Mr. Madden, you mentioned a couple of things; one, calling for deregulation, but you also said something about having a rollback in the prices.

Mr. Madden. Yes.

Senator Nickles. Is that correct?

Mr. Madden. Yes, I favor a rollback because we've got a lot of gas in Louisiana. We have two good wells and we haven't been selling it. Now, if they rollback the price, that would create more demand and more jobs, because I know the employment has been hurt, I understand, too.

Senator Nickles. Now, are you speaking from the interest of—you have a couple of wells yourself?

Mr. Madden. I don't own them. I am just a royalty owner.

Senator Nickles. A royalty owner in those wells.

Mr. Madden. A little money in case of deregulation and prices go up, I would want more money, because low production and the gas is so high is the reason we haven't been able to sell it and we haven't been getting as much money. We're royalty owners.

Senator Nickles. You find yourself in the situation where we have a lot of people, a lot of royalty owners and a lot of producers in the States of Oklahoma, Louisiana, Texas, and others that are sitting on some gas that won't move, won't move for maybe a variety of reasons; maybe the price is too high or maybe the economy is down and that marketplace function is not really working to that extent.

You feel like maybe if we had deregulation, the prices would come down and the law of supply and demand somewhere would equate itself and you would start moving that gas?

Mr. Madden. That's right.

Senator Nickles. So you'd have some checks, which is better than no checks, even if it's based on a lower price per thousand cubic foot.

Mr. Madden. Right.

Senator Nickles. I appreciate your comments. I also appreciate your comments about the inequity.

Do you feel like you've got a little bit of inequity there? If your gas is not selling and you're willing to sell it for $1.50 or $2, and yet you see big contracts where we're importing Mexican gas—let's bring this closer to home. Let's say you're sitting on some gas in Texas. It's not too far from the border.

Does it seem equitable to have your gas shut in when you're willing to sell it for $2 and you see contracts that are being made to import Mexican gas at $4.50? Does that seem wrong?

Mr. Madden. Yes; it seems like to me it should be the same, Senator Nickles. Because they're paying more—$4.50? Do we give them $4.50?

Senator Nickles. $4.94, actually.

Mr. Madden. Seems that would be an inequity there, like we should get the same amount.

Senator Nickles. You pay taxes in this country, but you don't like subsidizing their government?

Mr. Madden. No, sure don't.

Senator Nickles. I would share that concern with you.

Mr. Lucas, can you tell me how many royalty owners there are in the State of Oklahoma?

Mr. **Lucas**. It's difficult to determine, but we think there are somewhere around 313,000 in the State of Oklahoma.

Senator **Nickles**. I am glad you told me that. I've been using 200,000, but it is a hard or difficult figure to determine. That 313,000, is that the person that's receiving the check or is that the number of families or——

Mr. **Lucas**. That's the individual royalty owner, right.

Senator **Nickles**. You mentioned 1.3 million nationwide with an average royalty check of $250 per month.

Mr. **Lucas**. Yes, sir, that's 1.3 million natural gas royalty owners and 2.5 million oil royalty owners.

Senator **Nickles**. OK. Couple of questions. You mentioned, if I remember the term, the—I don't know if you said the oil and gas industry or the gas industry is sick. You work for a drilling company in northwestern Oklahoma that builds drilling rigs and also is in the drilling business; is that correct?

Mr. **Lucas**. That's correct.

Senator **Nickles**. Is that the J. D. Hodges Co.?

Mr. **Lucas**. Yes.

Senator **Nickles**. Can you tell us a little bit what the status of the drilling industry is in the State or in the Nation or in your company individually? How would this bill affect you if we had a rollback?

Mr. **Lucas**. Well, first, let me comment on the first part of that. There is essentially no manufacture of drilling rigs occurring at the present time anywhere that I know. There are a tremendous number of rigs stacked. Rigs can be bought at 25 to 30 cents on the dollar. Drilling is off over 60 percent in the Oklahoma and Texas panhandle compared to 12 to 14 months ago. There is just——

Senator **Nickles**. And I think I—if you'll excuse me, I read in the Tulsa paper, which came out with some new figures on active rigs—of course, these figures change on a day-to-day basis, but in this morning's Tulsa paper, Oklahoma had 292 rigs as compared to a peak of a little over a year ago it had 882, and then nationwide it said currently there are 2,274 active rigs as compared to a peak, again, a little over a year ago, of 4,530.

Mr. **Lucas**. That's more than the percentage that I expressed.

Senator **Nickles**. Pretty significant decrease from the peak.

Mr. **Lucas**. The drilling activity that you're seeing right now is in the areas of shallow oil, which economically is really the only thing you want to take a look at right now because you can sell the gas. We're a party to 52 of the high-cost, shut-in gas wells. I haven't either the pipeline connection or gas contract, and we represent I think only a small part.

Senator **Nickles**. How many rigs do you have in the drilling part of your business?

Mr. **Lucas**. The companies that are under Mr. Hodges' control, the rigs are 31.

Senator **Nickles**. How many of those are active?

Mr. **Lucas**. We have 10 active rigs today.

Senator **Nickles**. Are they active in shallow oil did you say or——

Mr. **Lucas**. No; they are not what I call shallow oil. They're drilling in the 9,000- to 13,000-foot range for oil or gas.

Senator **Nickles**. Oil or gas. Are they long-term contracts that are still being completed or are they——

Mr. LUCAS. No; our long-term drilling contracts have expired.

Senator NICKLES. So you have, what, about one-third, then?

Mr. LUCAS. About one-third. It has been higher than that. Recently it's been lower than that and it's come back a little bit in the last 2 or 3 weeks, but we don't see any evidence of any kind of a continued increase.

Senator NICKLES. OK. You mentioned your strong support for deregulation. You also mentioned your opposition, strong opposition to the gas cap or rather—the other price control mechanisms that are in the administration's bill during the interim period of time. If we're given the alternative NGPA as it is right today with perpetual controls under old gas, and you mention you have a lot of royalty owners that are sitting on top of old gas and receiving small royalty checks as a result, do you think that the price restrictions, the gas cap passthrough limitations, et cetera, are too severe of a price to pay for deregulation by January 1, 1986?

Mr. LUCAS. I think, yes, it's too severe. I think we've all planned on the NGPA as it was written and we planned on that basis. I think there is not sufficient provisions in the bill we're talking about. You mentioned the small royalty owners' limited income.

The areas wherein we have low-cost gas, I don't see anything in the proposed amendments that will cause those contracts to be renegotiated at a high rate unless there is common carrier status to pipelines.

Senator NICKLES. Even under the administration proposal where it would allow one party out by January 1, 1985?

Mr. LUCAS. I don't think it's going to happen. You know, I don't think you're ever going to see renegotiation of those old contracts unless you give common carrier status to the pipelines. If you have one party market-out and you have no pipeline connection——

Senator NICKLES. Are you aware that in the administration's bill, it does say if one party did opt-out——

Mr. LUCAS. I am aware of that. I think it calls for a hearing process. I think you get in all kinds of complications. The pipeline companies are going to swear their lines are full and they can't take it. I don't think it's an administratively feasible thing to accomplish.

Senator NICKLES. Mr. Lewis, I'll skip you just for a second.

Mrs. Hoeme, you're sitting on top of a field?

Ms. HOEME. True.

Senator NICKLES. And you're sitting on top of a lot of what we call 104 gas, forever-regulated gas?

Ms. HOEME. Section 104 gas under NGPA, and we personally have some mineral interests, and the lowest amount I receive from any of our checks is less than 30 cents a thousand cubic foot, but I know of neighbors who are receiving 17 cents. Most of ours is around 50 cents, 50-cent gas, and we cannot sell it.

At a recent stripper hearing which I appeared, they were applying for stripper status and one of the expert witnesses from a major oil company testified that the reason the well was shut in for 88 days out of the 91-day demonstration period was that their customer pipeline company was unable to take the gas but for 3 days out of 91.

Most of our wells—our checks even at 50-cent gas have fallen from 100 percent to 1,000 percent. They've dropped that much because—we have lots of gas, but they simply cannot sell it, and it's the good old cheap old gas, and when I testified in Washington before the Federal Energy Regulatory Commission, in one—it was a contaminant case—in one instance, there was approximately 75 intervenors from the giant Northeast, such as city of Chicago, NIGAS, Northern Illinois Gas Co., Indiana, Minneapolis, Minnesota, huge corporations, they want our old gas; they want our old gas, and that's what they want, and they want it cheap, and under the present system, if we want to—we can't even go out and tie on. The gas is on our land.

As I said, all of these other things are—we realize they have to be there and we want to cooperate with the gas and oil industry, but we think it should be recognized that we're not the same type of purchaser as an agricultural purchaser in Nebraska who can buy our gas cheaper probably than we can and he has none of these inconveniences of farming around their installations. On one place alone, we have nine vents that we have to farm around, and when you irrigate, it's a big nuisance.

Senator **Nickles**. You mention that you're irrigating and you have the gas pumps, irrigation pumps.

What prices are you paying for natural gas for irrigation purposes?

Ms. **Hoeme**. This varies greatly. If you happen to be on the one utility company that serves our area, Southern Union, you could be paying over $5 a thousand cubic feet for gas to be purchased for less than 30 cents in our area, but if you—most of our people are on wellhead gas and this is why I am so concerned about getting this part in the bill about recognizing that this gas comes from under our land. It's right there, and we must have it and we cannot—the farmers are in the—we're in the unique position of being both a first-time sale as royalty owners and an end user, so whatever the price goes up on wellhead gas—for instance, if it went to $2.50, our price of irrigation gas would be about $400 for an irrigation well, and we happen to have five of them; $400 for a well would go to $2,000 a month for pumping. This is totally unfeasible. We're out of business the minute that happens, and if we're out of business, so are all the other irrigation farmers.

The impact would be tremendous on our beef industry and on everything in our area, but we are selling the gas for 17 cents to 50 cents and we also are curtailed right at the present time. I couldn't—we couldn't—I had a gentleman call me the other day saying he had just put down a well and wanted to know if I could hurry and speed up the thing; he wanted to tie on. He probably invested well over $40,000 in putting down the well and probably $150,000 on the land. He said can you speed it up. He has to go through the pipeline company; he has to get a release because our gas is dedicated to the giant Northeast.

That's why there were 75 intervenors there appearing against me, taking at least an opposite position from mine in the hearings in Washington when I testified before the FERC.

Senator **Nickles**. Do you have any idea how much or what percentage of the gas in that area is shut in? I think we had testimony yesterday——

Ms. **Hoeme**. All I know is they—all that I do know is that in visiting with some of the workmen that work for the companies, they try to sort of spread it around so everyone will get a little royalty check, and I do mean small. I got one for $5.24 the other day. I really thought I'd send it back because I don't think they could afford it, but our wells seem to be shut in. As I said, in this one case—they deliberately chose their own demonstration period for their stripper case. Ninety-one days in which they produced the well only 3 days. The rest of the time it was totally, physically shut in by a great big value due to the fact that the pipeline could assure them that they could take the gas only 3 days out of 91, and they were applying to have those 88 days declared production days so that they could divide it by the—the devisor would be 91 rather than the correct 3 days, which was the only 3 days they operate it.

If they did it for 3 days, the reduction is 1,091 a thousand cubic feet, which would have been over 300 a thousand cubic feet a day, which is 5 times what is required for stripper status.

Senator NICKLES. Let me ask Mr. Lewis a couple of questions. I appreciate this information and the amount of homework that you've done in compiling—I think maybe refuting a statement that we have heard many times. We've heard many people say that the NGPA price ceiling—and there are 28 different price categories under NGPA, instead of being a price ceiling, it becomes a price floor because many contracts, et cetera, are automatically pegged to those.

You show in your chart that Oklahoma 102 is currently selling—or in February, 102 was coming in at about 24 cents per thousand cubic feet less than the maximum 102 prices, and then for 103, you show a difference of, what, 51 cents.

So it is, I guess, a fact, at least in Oklahoma, that the market price is substantially less than the current NGPA ceiling; is that correct?

Mr. LEWIS. That's correct. Maybe to elaborate on that, I would think maybe a year or year and a half ago, that would have not been the case. I think that the—and these prices represent for the last particular month that is available. They are not summaries of all historical 102's; they're summaries of all NGPA filings submitted to the Corporation Commission in those particular months. So this is not a cumulative but is rather a picture of one month at a time. I'd like to make that point clear.

Senator NICKLES. It shows that the industry is pretty ill—prices are depressed and in some cases fairly well below the present ceilings, but possibly that wasn't the case in the past.

Mr. LEWIS. Certainly. I think that's the—you could look at—some examples are Phillips. A lot of Phillips' contracts are 85, 88 percent. You know, that's not unknown to people.

Senator NICKLES. The contract will still be pegged to NGPA, but not 100 percent of NGPA.

Mr. LEWIS. Not a percentage of the maximum lawful price.

Senator NICKLES. Can you tell us what has been happening in deep gas prices over the last year?

Mr. LEWIS. Been going down. You know, we're joking about that, but we wouldn't be here if this wasn't serious.

Mr. MADDEN. That's right, this is serious.

Mr. LEWIS. The difficulty that is happening today is deep gas needs the old gas. It needs a cheap gas because it's a lot easier for a pipeline to justify 1 thousand cubic foot at $9 and 1 thousand cubic foot at $1 together at an average price of $5 than it is to justify everything at $9. They're going to have to—I think it's in everybody's interest if we can keep the average price of gas down as far as we can, because the more people that switch to alternative fuel oils, we're lost.

We've got to get demand up, and speaking in the same area Mr. Lucas did and the other speakers, there are two or three ways we can get demand up. One, we can prohibit as much as we can any imports. Two, we can try to get the price down and recapture these markets we're losing. We're going to lose the industrial market. If natural gas prices are considerably above the comparable price of fuel oil, we're going to lose the industrial markets. That's just economics. I think everybody understands it.

Senator Nickles. You stated that current market conditions have natural gas at less than even NGPA ceilings.

Then is it your opinion that if we totally deregulate it, that you'd see prices increase or decrease? Is NGPA holding the prices down or is the market holding the prices down?

Mr. Lewis. I am an economist by trade and my background is in economics and statistics. I don't have any data that I can make a statement. I can just speculate.

I think if there was decontrol, there might be a short term flyup in prices, but in the long run, I think prices would drop. And I have no data to support either position there, but that's just my gut feeling. I wish there was more data available; there just isn't, and that's one of the difficulties we have.

Senator Nickles. Let me ask a question possibly of any of the panelists. Mr. Lucas, let me first make sure if you—do you agree with the idea of keeping controls on old gas so it would help subsidize deep gas?

Mr. Lucas. That's correct. I think that we have to realize that you

Senator Nickles. Including on old gas?

Mr. Lucas. That's correct. I think that we have to realize that you have to average—you know, the mix of the pipeline determines its average cost of this gas.

I think if we're talking about decontrol, we do not necessarily mean that the price of gas generally is going to fly up. I think we can point to what happened when we decontrolled oil.

You will recall the discussion of oil prices are going to fly up when we decontrol oil. That was not the case. In fact, we increased oil production the year after for the first time in a decade before, and since that time, we've been able to reduce our dependence on imports by 40 percent.

And I don't see how we can have a flyup in the price of natural gas if we decontrol it. There's an excess available and it's just not going to happen. And in the process of renegotiating all these things, it's a complex issue, and it will take time to renegotiate the contracts, and I just don't think we'll see a flyup.

I think we will still have a mix of high-priced and lower priced gas within an unregulated market, and it will be dependent upon a producer in a deep gas well to look for a purchaser that has a certain amount of low-priced gas available and he can pay him a reasonable amount that will allow him to recover his investment in that deep gas well. You know, you're still going to have those various kinds of forces at work even though you have an unregulated market.

Senator Nickles. One final question because we have several other panelists that we need to get to.

Ms. Hoeme, did the city of Guymon ever—I know they were seeking some gas supplies and trying to get a contract—did they ever get that contract signed, do you know?

Ms. HOEME. Their price went up precipitously. Incidentally——

Senator NICKLES. But they did get the contract?

Ms. HOEME. Some of the gas supplied to them comes directly from under our land. It just so happens that Mobil produces it. I asked them why—on our checks, why the prices varied so much from what we received. He said the word Guymon buys the higher royalty check.

I didn't finish answering your question, I don't believe, about the price of gas. I did answer if they were on a public utility, but the main thing that's important to us is to be able to buy wellhead gas and at a price we can afford because the majority——

Senator NICKLES. What do you pay for the wellhead gas?

Ms. HOEME. That's what I didn't finish telling you. That's approximately 50 cents. So if it went up to $2.50—as I started to say, our bills are now $400 a month, it would go $2,000 a month a well. We couldn't—if you have five wells, that's $10,000 a month. Agriculture too is sick, very, very sick, and they don't get that sick without being contagious.

Somebody else is going to catch it, too. When we go down, I am afraid someone else is going to catch what we have. I wouldn't want them to be as sick as we are, I really wouldn't. Thank you.

Senator NICKLES. We appreciate your comment and the rest of our panelists for your expertise and input in this area. It's very much appreciated and I think helps give us a good perspective of what different people think we should be doing. Thank you very much.

On our next panel, we have Mr. Blake Arnold, who is president of Arnold Petroleum; Dorsey Buttram, who is president of Buttram Energies; Doug Cummings, who is president of Cummings Oil Co.; and Ray Potts, representing the Oklahoma Independent Petroleum Association.

Senator NICKLES. Mr. Arnold, do you care to lead off?

Mr. ARNOLD. Senator Nickles, I'd like to first say that the testimony that I have prepared, and this goes for you too, Mr.——

Senator NICKLES. Mr. Arnold, just a half a second.

We might try to have a little more order so we can hear our panelist. Go ahead.

STATEMENT OF BLAKE ARNOLD, VICE PRESIDENT, ARNOLD PETROLEUM, INC.

Mr. ARNOLD. Thank you. The testimony that I prepared was based on the fact that a proposal has been presented by the administration, and I understand that politics in Washington is the art of compromise and therefore my testimony does not probably reflect my true feelings; however, it reflects my feelings based on the fact that the proposal has been presented and will most certainly be compromised upon in the legislative process.

Regarding the President's proposal, I approached it by trying to state two principles that needed to be addressed. The first is that obviously the cost of natural gas to the consumer has gotten to a price where it's unacceptable and I believe that we've gotten to this situation primarily because of previous legislation and controls on natural gas. One is obviously the 1978 NGPA that allowed monthly increases on certain categories of gas regardless of supply and demand situations. Second, that the 1978 NGPA also encouraged deep drilling of natural gas which necessitated that pipeline companies buy large quantities of expensive gas in order to maintain their supply situation, and, of course, the third thing that has brought about the high cost of natural gas is the Fuel Use Act, which has resulted in a loss of market and brought about a situation where we had to have costs passed on to the consumer instead of industry, but that was—the first principle was that I think we have to agree that natural gas to consumers is too high right now, at least that's what I hear. The second principle was the fact that we have to encourage continued exploration and development of natural gas, and you have to have adequate price incentives to do that.

I think it needs to be kept in mind that—one estimate I've heard is that simply to meet demand in the next 5 years, there is a predicted natural gas shortage in 1985 to 1991, but to meet demand in the next 5 years, it's estimated we will have to drill an estimated 100,000 natural gas wells. In the last 5 years, we drilled 75,000. Most of these wells, probably the majority of them, will be drilled by the independents, and the independents are the primary source for replacing diminishing reserves. Therefore, I looked at the President's proposal in those two lights.

One, would it provide lower prices to the consumer and, two, would it provide adequate incentives for continued exploration and development, particularly among the independents. I suspect that the proposal will provide lower costs to the consumer. I don't know that, but I suspect that's the case. As to whether or not it will provide adequate incentives for exploration and development, I think the President's proposal is seriously flawed. I think that too much of a burden is placed on the producer, particularly the independent producer who, again, drills the majority of new wells and has discovered the majority of new gas since 1977. I think that it places too much of a burden on the independent producers, primarily because with the deregulation of old gas, you're going to have consequent higher prices for that gas and those higher prices will be figured into the proposed gas cap. If those old prices receive a higher price—if the old gas receives a higher price, the new gas found since 1977, which is going to be subject to this gas cap, will invariably have to decrease. The figures that I've heard are $2.25 to $2.50 for this gas cap.

Currently, for instance, for section 102 and 103 gas, we've received anywhere from $3 to $3.75. So we're looking at a drop in revenue for the independent for section 102 and 103 gas from 25 to 35 percent.

Senator Nickles. What did you estimate the gas cap would come in at?

Mr. Arnold. I have heard $2.25 to $2.50. Obviously, at the same time that the independent producer is experiencing a drop in revenues, the major oil companies will experience a tremendous influx of revenues.

I think that the proposal is flawed in that it doesn't treat all producers fairly or in an equitable manner. Again, the majors will receive a tremendous boost in the arm; the independent producers that produce section 102 and 103 gas will realize a tremendous loss in revenues and at the same time, producers of deep gas, which is a sensitive subject in Oklahoma, but under the President's proposal, they receive a price freeze. I find that unfair for the producer who develops and finds gas at intermediate ranges from 10,000 to 12,000 feet.

I then tried to come up with some alternatives and suggestions in light of the President's proposal. Obviously the thrust of my suggestions is that the independent producer needs to be protected more so in the proposal than he is now.

One suggestion that I had was instead of to immediately deregulate old gas and have that price increase and have the price for new gas, 102 and 103 gas come down, deregulate old gas gradually so that you may have a higher price cap, which will give the independents increased revenues and more incentive to drill. That would be averaged out to the consumer by the fact that you still had some old gas under old contract. So I think that there must be some type of a way to bring about the complete deregulation of old gas without having independents suffer a loss of revenues. Otherwise, if the independents do suffer the loss of revenues, we're going to quit drilling wells, there's going to be a shortage. The consumer will pay in the long run.

I think another method to insure that producers get adequate price incentives is something that you've alluded to, and that is to include imported natural gas and synthetic natural gas and liquified natural gas into the gas cap. The way I see it, the gas cap is supposed to be some type of a weighted average, but if it excludes those categories, I see a situation where the independent producer is again suffering a tremendous harm at the expense of imported fuels. That's about all I have to say. I would like to reiterate that I think the proposal is placing entirely too heavy a burden of responsibility on the producer, particularly the independent producer. We cannot endure a drop of revenues of that magnitude and continue to drill gas wells at this point in time.

[The prepared statement of Mr. Arnold follows:]

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March 29, 1983

Senate Committee on Energy and
Natural Resources
United States Senate
Washington, D.C.

Attention: Senator Don Nickles and
other Committee Members

RE: Testimony on the Administration's
Proposed Deregulation of Natural Gas

Gentlemen:

The President has proposed legislation to completely decontrol natural gas by January 1, 1986. The proposal is well conceived in light of the current conflicting situations that key members of the industry find themselves in. His proposal is necessitated by the complete failure of the Natural Gas Policy Act of 1978 to adequately ensure cost efficient supplies of natural gas to consumers in accordance with market forces - forces that are in effect from the producers wellhead to the consumers gas range.

May I first add that it was obvious to any bipartisan player that the NGPA of 1978 was doomed from its conception. No industry can effectively respond to market conditions when its basic commodity - in this case natural gas - is subject to a complex set of rules that establishes over twenty (20) prices, ranging from 21¢ per MCF to $12.00 per MCF, for that basic commodity. This should be well remembered when the President's proposal is subjected to the partisan whims of Congress.

One of the major stumbling blocks in agreeing on an adequate bill is the current inability of the industry players to agree on what does or does not need to be done. Producers, pipeline transmitters and utilities all have different problems which can only be remedied by different doses of medicine. Therefore, before attempting to treat the patient, I believe it is helpful to state some agreed upon principles. Only by keeping these principles in mind can industry draft a united plan to present to the Administration:

I. The need for new legislation has been brought about by the increasingly high cost of natural gas to the residential consumer. These costs have been inacted and caused in part by the following:

1. As a result of the provisions of the 1978 NGPA, prices have been allowed to increase monthly on many categories of gas, regardless of the supply and demand market conditions.

2. The 1978 NGPA encouraged deep drilling, as gas found below 15,000' was not subject to governmental price control. Therefore, a large portion of the new reserves found, and consequently contracted to buy by pipeline companies who needed to ensure adequate supplies in the future, was expensive gas.

3. With the inactment of the Fuel Use Act of 1978 heavy industry, the natural gas industry's largest market, began switching to alternate fuels. As utilities lost heavy industry, it became necessary to pass on their increasing costs to their only remaining market - residential consumers.

It should be reiterated that these cost increases were the primary result of price escalations in the 1978 NGPA and high cost deregulated gas which pipelines were forced to buy for lack of another source for adequate long-term supplies.

II. The current high supply-low demand situation will inevitably disappear, in the near future, with the occurrence of the following:

1. The repeal of the Fuel Use Act of 1978, thereby increasing the industry's market and encouraging consumption.

2. The eventual economic recovery.

3. The inability of the producers to consistently replace diminishing reservoirs with new reserves. It is anticipated that in order to meet normal demand expectations and to maintain adequate reserves it will be necessary to drill 100,000 new gas wells in the next five (5) years. For the five (5) year period ending in 1982 only 75,000 new gas wells were drilled.

Therefore, the need to ensure sufficient supplies in the years to come, which can only be accomplished by adequate incentives for the drilling of gas wells, needs to be given as high priority as the dilemma that currently confronts consumers. Otherwise, the consumer will be faced with unacceptable shortages in the future.

Now that some basic principles have been set forth, it is possible to state a few ideas that the natural gas industry inevitably must agree upon. First, thirty (30) years of regulation of the natural gas industry by the Federal Government has never succeeded in producing adequate long-term supplies at its most efficient price.

Second, in order to eventually develop the most efficient market all gas, old and new, deep and shallow, should be subject to prices as determined by a free market.

Third, the consumer needs relief from currently unacceptable high prices.

Fourth, in the immediate near future, there must be adequate price incentive to replace diminishing reserves with new reserves. Inasmuch as the independents, not the majors, are discovering the vast majority of new reserves, it is the independents' cash flow needs that should be given a high priority in any legislation.

In the context of the above, does the President's proposal adequately address the above principles and does his proposal coincide with the common ideas of the natural gas industry? I believe his proposal is a good starting place, but it does not ensure that all that should take place - that is lowered costs and adequate supplies - will take place. Specifically, I have the following complaints:

> 1. The proposal calls for the immediate deregulation of old gas. Whereas the deregulation of old gas is something to be desired for the future stability of the market, the immediate effect of such a move is that the process of freeing prices of old gas will result in an offsetting reduction in prices paid for Section 102 and 103 gas discovered since 1977. This is a result of the proposed "gas cap" as outlined in the President's proposal.
>
> Obviously, the major oil companies would experience a tremendous increase in revenues as a result of such legislation. Correspondingly, the independents who have discovered the vast majority of new reserves since 1977 will suffer a tremendous decrease in revenues. Inasmuch as the independents are the only source for new reserves, such a measure is obviously counter-productive. Independents with a loss of revenues will drill fewer wells and find less gas, ultimately causing a shortage of supplies and increases in cost to the consumer.
>
> 2. The proposal freezes Section 107 gas - that gas that is currently deregulated - by placing a ceiling at current levels for existing contracts. Certainly, most Section 107 gas is priced above market clearing levels, thereby making it priced artificially high. By freezing Section 107 gas and not allowing it to decrease to a free market price, all other gas, especially Section 102 and 103 gas owned primarily by independents, must be rolled back, resulting in a loss of revenues and an artificially low price.
>
> 3. Take or pay contracts in excess of 70% of deliverability could be abrogated by pipelines. Take or pay contracts are a tool, very similar to utilities averaging heating and cooling expenses to residents, that allows the producer to have sufficient cash flow to stay in business. A repeal of the take or pay provision will only further damage the already precarious position of independents in a cash flow bind.

As described above, the obvious losers in the President's plan are the independents, especially those who have actively explored for Section 102 and 103 gas since 1977. Estimates are that the proposed "gas cap" will result in a rollback for such gas to around $2.25 per MCF, and perhaps lower. The obvious winners are the majors and the producers of deep gas who would experience an economic bailout with the proposed freeze on artificially high prices.

As described herein, the role of the independent is vital to ensuring adequate supplies of low cost gas. In my opinion the bill places too heavy a burden on the independent producer - precisely the entity the bill should not damage if prudently constructed.

As an alternative to the President's proposal, I believe a bill can be written whereby all producers - old gas producers, new gas producers, and Section 107 gas producers - can more equitably suffer the hardships necessary to move the industry towards the principles stated herein. Specifically, I suggest the following modifications:

1. In order to achieve the goal of market driven industry by January 1, 1986, it is essential to deregulate all gas. However, rather than deregulating old gas immediately and causing a rollback of new gas at the wellhead, deregulate old gas gradually with all gas to be deregulated on January 1, 1986. The result would be a higher "gas cap", but this would be offset to the consumer by maintaining low prices for some old gas. Meanwhile, the independents would not suffer the severe loss of revenues which could irreversibly damage the search for new reserves.

2. The "gas cap" under the proposal could be the higher of the volume weighted average price of newly signed and renegotiated contracts or the price allowed under the NGPA of 1978 as of January 1, 1983, not to exceed said January 1, 1983, NGPA price. This would remain in effect until January 1, 1986. Such a measure would keep the independent operators revenue up to a level that would allow continued exploration and replacement reserves.

3. Currently deregulated Section 107 gas would be subject to renegotiation with some type of a floor price - perhaps the price paid for tight sands gas. Section 107 gas is already above market clearing levels and take or pay provisions for such high cost gas is a prime cause for consumer price increases.

The above changes would result in a "tightening of the belt" for all producers. Old gas producers would not experience the sudden increase of revenues, new gas producers of Section 102 and 103 gas would experience a price rollback and freeze, and Section 107 producers would also experience a rollback and freeze. However, the independent producer would not suffer as greatly to the benefit of the majors.

At the same time, the stated principles of achieving an end to run away prices to the consumer and ensuring sufficient revenues to the independent would be accomplished. The goal of a completely market driven industry would be realized on January 1, 1986. I would support the above changes or something similar to them, as they would go a long way - further than the President's proposal - to ensuring long term supplies of reasonably priced natural gas.

Sincerely,

Blake Arnold

Blake Arnold
Vice-President,
Arnold Petroleum, Inc.

Senator NICKLES. Thank you very much.
Mr. Buttram.

STATEMENT OF DORSEY BUTTRAM, PRESIDENT, BUTTRAM ENERGIES

Mr. BUTTRAM. Senator, I too will add my thanks to you for coming, because I personally know that you are deeply concerned about what's going on back home and thank you for that.

One of the problems of being on down the list of speakers is some others have already touched on your subject, but in reality that makes me feel kind of good because it means that I am not alone in my thinking. These serious debates here on the various facets of this bill are certainly being discussed and I don't plan to do that.

I want to touch on just two subjects and they are relevant to the industry, but I think to the entire economy in the United States and I am desperately concerned over them. The first, of course, is this opt-out, the voiding of contracts, and, as you said, in Tulsa that this had been discussed. But pardon me if I am being repetitious since I don't know what was said up there.

I am desperately concerned on that opt-out, and with our representative from the administration, Mr. Cantrell, here, I will not agree with him on some of his thoughts because I don't think they favor the consumer and they favor the major oil companies, and I would like to explain.

As I read the generalization—believe me, I can't read the legal language of the bill as such, but the IPPA has put out a synopsis which I myself will personally accept as definitely accurate.

In their synopsis, they state, as we all know and has already been mentioned once, that there is the opt-out agreement, and if it cannot be agreed, one or the other cancel out of the contract.

To me I find that a little difficult to take. I dont' have any take or pay gas and I dont have any $12 gas, but if I did, I'd be broke today if this bill goes through because I can guarantee you I know people in this community and this industry that have drilling projects and have invested and committed funds to these repayments of those binding contracts. I'm glad I don't have to say what will happen if they are voided and they are forced to take a lower price.

Now, so much for the high price. I can guarantee you, and, Senator, I know you have personally asked for individual comments, and I'll give you one more.

About 2 or 3 years ago, I plugged out a field with 9-cent gas. The first party here never has a chance at 12 cents because I have 9 cents. I operated that under a 20-year contract and I tried in every way I knew how to renegotiate that contract. It wasn't a city and it wasn't a village. It is what you want to call a community or a town. It was their sole supply of natural gas and I was losing my shirt. I couldn't get out of it. They refused to renegotiate and I plugged the field. That's the only way legally I could get out.

Now, was that fair to the city—to the town? Supposing the opted-out had been effective there and I say, OK, I am opting out. The only choice they would have would be to go to higher priced gas because nobody's going to sell them gas at 9 cents any more than the poor producer at the $12 gas or the take or pay gas if the major—sorry, major, I shouldn't have said that, the consumer—not the consumer, but the purchaser would opt-out, and obviously if they don't want it, who else is going to pay that price? He's the loser every time. So to me there is nothing fair about this opt-out. How are you going to resolve that, there's enough legal minds in Washington in my opinion that can settle that. But if you make an example of the oil industry by voiding the sanctity of contracts, what about my son with 20½ percent interest on a home? Are you going to say that he can't use that example and come down to the lower interest today of, what, 10½, 12 percent? When is the sanctity of a contract going to be valid and when isn't it? Business is based on integrity and you void that, we're in trouble. That's my first subject.

Now, again, it was mentioned today about the pipeline and common carriers. I have visited with people on the consumer end and again, in the opening comments, I plainly remember an emphasis on the consumer.

I can remember in the middle to late 1970's when the consumer was really in trouble because we, the producers and independents, couldn't supply the gas. There was no compassion for us then.

So I feel—and this is typical of Washington's thinking. They're always thinking in terms of the major oil companies. That's, I think, what was meant when they said, well, if he can't take—if he opts out on the high price gas, he can go move and take some lower price. I don't have that. The big companies can do that, and I think the thinking of most of Washington is all around major oil companies and what they can do, and as I'm sure its been discussed with you, many times over, it's the independent who is to do the work, and we can't afford that.

Now, that's typically true on this—as you heard very adequately on the panel before us on the common carriers are the pipelines. They're the only carrier I know of in the United States that is not a common carrier. The airlines, the truckers, railroads—shall I go on? But the pipelines have a monopoly, and all the oil I sell, I don't sell it to those pipelines. I sell it to the refineries, not the pipelines.

Your compadre, Senator Kassebaum, back in November, December, somewhere in there when there was really some complaining in the northeast consumer section about their prices escalating 20 to 25 to 35 percent while our prices were dropping, her remedy was to freeze the wellhead price. I couldn't understand that logic. The price is obviously in the pipelines, who are a monopoly, and as—well, as the economist before us said, the less that goes through that pipeline, the higher—the more the price will be for the consumer end and there is your problem.

To me the pipelines are going to have to be converted to the common carrier and you have—I am sorry, not you, the administration has suggested in part of this where they say if there is no agreement, the pipelines will have to take that gas that is in dispute as a common carrier with a fair price of transmission.

If you resolve that problem and convert the pipelines into a common carrier, I think you will solve this horrible discrepancy with our price dropping and the consumer price rising as high as 35 percent that I've heard of in the northeast and, sir, that's all I have to say.

Senator NICKLES. Thank you very much, Mr. Buttram.

Mr. Cummings.

STATEMENT OF DOUG CUMMINGS, PRESIDENT, CUMMINGS OIL CO.

Mr. CUMMINGS. I am Doug Cummings, president of Cummings Oil Co., a small independent oil company located in Oklahoma City. I've been involved in the oil business for approximately 30 years.

I appreciate this opportunity and, Senator Nickles, to the thanks of you and your staff for your efforts in this process. My comments are general.

I commend the administration for its courage in proposing legislation for deregulation of the natural gas industry.

Most of we independents are so busy running our business, it's difficult to be fully informed of the details of any proposed legislation, but principles should apply.

The intentions of the administration to move to a free market is fundamentally important. Such move will obviously cause many dislocations and problems for all participants; producers, purchasers, consumers, and within each group there will be adjustments due to these problems. These cannot be totally eliminated in our escape from controls.

A few comments in general on the proposed administration bill. Abrogation, no. Extending any controls beyond January 1, 1985, no.

On the specific issue of gas cap, I would suggest this be tied to new gas contracts only. I would further suggest that a feasible gas cap mechanism is where the mechanics have been agreed on, that these be held in abeyance to be enacted within and during the period ending January 1, 1985, and to be put in place only if necessary to reduce a so-called fly-up of prices at the direction of the President. This will give the consumer a psychological peace of mind which really is needed.

Senator, you have been presented a large volume of testimony and facts and figures to which I could not make a meaningful addition.

The importance of this issue is clear. To correct the confused, misdirected conditions in which we find ourselves in this country, we must pursue complete decontrol of our natural gas industry immediately.

Senator, thank you and your staff for your efforts in this process and I'll defer my remaining time to Mr. Ray Potts.

Senator NICKLES. Thank you.

Mr. Potts.

STATEMENT OF RAY H. POTTS, PRESIDENT, OKLAHOMA INDEPENDENT PETROLEUM ASSOCIATION

Mr. POTTS. Senator Nickles, my name is Ray Potts. I am currently the president of the Oklahoma Independent Petroleum Association, with about 1.400 members. I am also president and chief executive officer of PSEC, Inc., a small oil and gas firm with about 20 employees. Our company was incorporated in Oklahoma in 1967. At the present time, we operate about 70 wells of which 64 are natural gas wells. So you can see natural gas legislation is very important to our company.

Recently Secretary Hodel, while questioned regarding the impact of old gas decontrol on the independent producer of new and high cost gas, was quoted as stating: "A handful of producers can't stand in the way of rationalizing an industry."

Senator, before proceeding with the statement—a statement on the administration's proposed natural gas deregulation bill, I would like to point out to this committee and Secretary Hodel the contributions that the independent producer makes toward meeting the U.S. energy needs.

Today there are about 15,000 independents such as I in this country. According to the American Association of Petroleum Geologists, independents drill 89.5 percent of all wildcats, discover 84.4 percent of all new fields and found 56 percent of the oil and gas reserves in the domestic United States during the recent 5-year period.

In contrast to the major oil company, most independents do not own pipelines, refineries or filling stations. An independent company can be a few people or 100.

Regardless of the number, we are vital to the energy process and therefore I take exception with Mr. Hodel's statement. The independent has and will play an important role in meeting this country's natural gas needs.

Everyone here today is aware of the existing unhealthy condition of the natural gas industry. We are also aware that the only commodity still under price controls in this country is natural gas. It is estimated that today we have a natural gas distribution surplus of 3 trillion cubic feet of gas, and our total gas production in 1982 was 18.75 trillion cubic feet of gas.

For the past years, most producers have experienced a significant curtailment of their gas production. Producers are also experiencing difficulty in obtaining gas contracts on recently completed gas wells.

My own company completed two gas wells in the Arkoma Basin in November 1982, and as of this date we have not been able to obtain a gas contract for these wells. These two wells are about 7,000 feet deep with a combined cost of $625,732.78.

While all of this has been occurring on the producer's side of the pipeline, the consumers' gas bills have continued to rise. At a time of surplus, the opposite effect should have occurred. The price should have gone down.

Many analysts believe that the single-most important reason for this paradox in the natural gas arena is the Natural Gas Policy Act of 1978. It simply has not worked.

Now, it's my understanding at the present time there are three key legislative proposals on natural gas before Congress. They are the administration's bill S. 615 and H.R. 1760, Senator Heinz' bill, S. 689 and H.R. 1752, and Representative Gephardt's bill, H.R. 2154.

Secretary Hodel and the administration, as Mr. Cantrell has already stated this morning, are firmly convinced and committed to three broad underlying principles that must be a part of any proposed natural gas legislation, and these principles are:

There must be freedom for the parties to negotiate and thereby move towards a free market. Old gas should be decontrolled thereby permitting more low cost gas to reach the market. Three, there must be an element of consumer protection.

Sir, I strongly believe there is a fourth principle that must be a part of this legislation, and that is, there must be adequate future gas reserves. Without the fourth principle, we could easily repeat what commenced 29 years ago when the natural gas industry was first regulated.

In the process of protecting the consumer, the price of natural gas was set so low that the domestic industry was practically decimated. In 1955 there were about 20,000 independents and 3,000 drilling rigs. By 1970, 15 years later, that number had decreased by nearly two-thirds to only 7,000 independents and less than 1,000 rigs.

On the basis of the four above-described principles, I would urge you to reject outright the bills of Senator Heinz and Representative Gephardt and endorse the administration's bill with certain modifications.

Some of the positive features of the administration's bill is that it brings an end to regulation. It repeals the Fuel Use Act and incremental pricing and opens gas markets directly to the producer. However, there are areas of the administration's bill that give me cause for concern, and these are—and I will repeat what's already been said:

The abrogation of existing contracts: One of the basic tenets of our system of jurisprudence is the contract. To enact legislation that allows one party to unilaterally alter existing contracts will cause undue damage to the way our Nation conducts its business. This bill allows either party after January 1, 1985, to abrogate existing contracts resulting in many potential inequities.

Two, the gas cap: As I understand the bill, the maximum price that can be paid for gas from the time of enactment of this bill until January 1, 1961, is equal to the volume-weighted average price paid during the first 3 months of deliveries under all contracts that have been executed or amended after the enactment of the bill.

Due to the large volume of old gas in comparison to the volume of new gas, the result in gas cap price will be distorted downward, possibly below replacement cost. Therefore, I believe that only new-gas contracts should be used as a basis for determining the "gas cap."

I also have serious concern about waiting until January 1, 1986, to deregulate natural gas. This is an additional year beyond the time when the Natural Gas Policy Act of 1978 was scheduled to terminate. At the present time we know we have a gas surplus, and with the current drastic slowdown in drilling by 1986 we may again experience a shortage of natural gas. Congress will never deregulate natural gas in a time of shortage.

Three, foreign gas: While only 4.8 percent of our total gas supply came from a foreign source in 1982, this area should be addressed in the proposed legislation. Prices paid for all foreign gas—for all foreign sources of natural gas are substantially higher than prices paid for domestic gas. If the domestic producers are to have their gas contracts changed, then it follows that foreign gas contracts should also be abrogated. Certainly the prices of the foreign gas contracts should be used in figuring the gas cap in the administration's bill if old gas prices are to be used.

The dramatic—excuse me, the domestic petroleum industry is going through a severe economic slowdown. In Oklahoma alone, there has been a 67-percent decline in active rig count in the last 12 months. Many factors have contributed to this slowdown. One important factor is the lack of capital from nonindustry investors who are fearful of oil and gas ventures.

Independents rely heavily on this investor for working capital. The major reason the investor is fearful is not knowing what price to use in evaluating oil and gas investments. The sooner this pending legislation can be resolved, the quicker stability will be restored to the industry.

Therefore, I urge this committee to move swiftly in the attempt to resolve the natural gas issue.

There are several other areas I could comment on, but in the interest of time, I will stop here, and in closing, I want to commend President Reagan for coming forth with a deregulation bill. Independent producers are probably one of the greatest proponents of the free enterprise system in this country. We believe in the marketplace. Deregulate natural gas and we will find adequate reserves to meet this country's needs.

Thank you, Senator Nickles.

Senator NICKLES. Thank you, Mr. Potts and the rest of our panelists.

I think you made some interesting comments, and I'm sure that Mr. Cantrell has heard a couple of times that the price of imports should be used in computing the gas cap. So there are probably several potential amendments as we mention the idea that the gas cap shouldn't be the market price for gas. There seems to be some inequities with leaving that out that would keep it from reflecting it.

I heard more, I think, from this panel than I've heard from any, and probably stated strongest by Mr. Buttram than any, on the sanctity of contracts, and so I appreciate, Mr. Buttram, your comments on their sanctity.

I appreciate the analogy that you make concerning the home buyer, the person who is either stuck with either a high or a low rate of interest and a long-term contract, a 20- and 30-year contract in most cases where those were entered into in good faith, some of which can be renegotiated, but here again, the Federal Government doesn't give one party an opt-out. So I think that was an interesting analogy.

You mentioned the fact that you were selling a municipality or town or something gas for 19 cents for 20 years?

Mr. BUTTRAM. Nine.

Senator NICKLES. I didn't want to inflate that.

[Laughter.]

Mr. BUTTRAM. But you have.

Senator NICKLES. And that contract, did you—you mentioned that you tried repeatedly to renegotiate it, but you were unsuccessful. So did you supply the gas throughout the full contract length?

Mr. BUTTRAM. No, Senator, like I told you, to clarify that, it was a 20-year contract, and 9 cents was agreeable at the time the contract was signed; and of course with compression, with all the additional costs that it takes as your pressures, your ground pressures, your flow pressures decline, it was necessary to add considerable expense and production to where I was losing money. I went back to this—I don't want to call it a village because it was kind of a town—and tried repeatedly to renegotiate with the mayor and the city council, and they said you have a binding contract; that's what it's going to be, and I was stuck with it.

Senator NICKLES. So are they saying that you violated the sanctity of the contract? Is that inconsistent——

Mr. BUTTRAM. No; because my attorney said, if you are losing money, you have the right to plug the field out. I didn't violate the contract. I just closed it because I was not making money, and that was—according to the courts, that was legal, and they gave me permission to plug the field out.

Senator NICKLES. And you make a pretty strong case, what, for the Federal Government in not allowing a one-party opt-out. If this happened—let's just take for example the language that's in the administration's bill—would kind of give an incentive between now and January 1, 1985, to renegotiate contracts, here again, let's take this example. You have a contract with this municipality or something for this gas. If they know that by January 1, 1985, that you can terminate the contract, this would propel them or give them more incentive, I guess, to renegotiate.

Mr. BUTTRAM. I agree with that, but that's the reason, Senator, I gave you the two parallels, the $12 gas or the take-or-pay gas, and the contracts are not voided by legislation versus the other side of it, which was this town who would not—that's where I was the loser, whereas before the other—the high price would be the losers, the producers would be. It works both ways and that's what I tried to give to you, an example where it wouldn't be beneficial either way.

Senator NICKLES. For Congress to say yes one party can have an opt-out.

You mention that you're not particularly for one, but there's several——

Mr. BUTTRAM. Senator, if I might clarify that point a little bit. If I had not been losing money, let's just say I was making money or breaking even, the courts would not have held for me and that town would have been validated as far as a contract is concerned to the limit of the 20 years. So you see, if we had had that opt-out, the tenant would have been the loser.

Senator NICKLES. OK. Let's take a hypothetical situation, might be a better approach. If you have a contract say for 40 cents and you've had that contract for 40 cents or 50 cents or something, and knowing full well that that's below the market price of gas, do you think that Congress should allow you as a producer to be able to opt out by January 1, 1985?

Mr. BUTTRAM. I most certainly do not. A contract to me is the most sacred thing we have in the economy of this country.

Senator NICKLES. So equally that would apply for the persons that happen to have a high-cost contract?

Mr. BUTTRAM. As I tried to say, if their economy is based on that and business is conducted on that basis, it would be disastrous economically to me if I had a binding contract voided for a lower price.

Senator NICKLES. You are pretty aware and any of the other producers can join in this. There are a lot of contracts—Mr. Arnold, possibly you might want to address this.

There are a lot of deep gas contracts that are in this area, particularly in the Anadarko Basin area where there are take or pay contracts. Part of the provisions, and I don't think it's been alluded to. One of the provisions would have an immediate rollback to 70 percent of take or pay.

Would this be very damaging or detrimental to producers that are possibly highly leveraged or would it have a major negative impact on producers in Oklahoma?

Mr. **Arnold.** I think if anybody could get on line 70 percent right now, they'd be a pretty happy fellow.

[Laughter.]

Mr. **Arnold.** I know we don't have too many wells that are on line 70 percent of the time. I really can't address that.

Senator **Nickles.** Do you have any of those take or pays that exceed 70 percent?

Mr. **Arnold.** Yes, we do. Most of them are 75 percent take-or-pay provisions. Some of the older ones are 90 percent.

Again, I agree with the gentlemen that have already spoken, that, one, I believe in the sanctity of a contract; two, to go back to renegotiations where you void an existing contract, in addition to any personal problems I may have with it, I can't think of anything that would be a bigger nightmare to administer. It would just simply be another intrusion into our lives as independents.

We spend most of our time trying to find new reserves, and it would just be another case of somebody giving us another problem that's going to detract from finding some more gas, but——

Senator **Nickles.** Would the rollback to 70 percent, though, affect you dramatically? I am trying—I am looking at several of the negatives that you might be looking at from an independent producer's standpoint.

One would be the rollback in take or pays immediately upon passage—I think it's immediate—or soon after passage to the 70 percent of take-or-pay.

We've had some producers that have indicated that is not that big of a problem. Then we get into the gas cap, which many have indicated would be a very substantial problem.

Mr. **Arnold.** It is a problem. I think if we have a gas cap and we suffer a reduction in revenues from $3.25 to $2.25, and coupled with that we had the take-or-pay provision reduction, that would cause severe harm. I think that if it could be accomplished between the parties, a reduction of the take or pay to 70 percent would probably be something that we could live with so long as we weren't also getting hit with the reduction in prices.

That's my personal feeling, that 70-percent take or pay is something that we could probably live with.

Senator **Nickles.** Mr. Potts.

Mr. **Potts.** Yes: I think if we could be assured that 70 percent of the time we were flowing our wells, there would be no problem with most independents I know. That's not a factor. To me, 70 percent would be very acceptable.

The problem that I see here in regards to this area of take or pay is I would like to repeat that it's so often misunderstood is that take-or-pay by many laymen is construed as a payment that's made to the producer for which he'll never recover that gas. The utilities here in Oklahoma City, Oklahoma Natural, for example, they allow the consumer to average his bill over a 12-month period of time. In the summer when he's not heating his home, he still pays an average gas price if he wants to or chooses to for that entire year.

Essentially, the producers have negotiated a contract that the price is going to average out over a given period of time, and I sort of resent that what happens so frequently, at least the story comes across, is that this is a gouge by the producer that we are doing to the pipelines and thus to the consumer, that the point is never really made that this gas is made up free later, that they don't have to pay for this gas again. They get to recover it at a future point in time, so I—it's a little beside the point of your question, but I would like to have the opportunity to express that point that somehow seems to be lost when we talk about take or pay.

I would say that 70 percent would be very acceptable to most producers in the State of Oklahoma.

Senator NICKLES. In fact, have most of the producers negotiated with the buyers—in cases where they've had high take or pays and high price contracts, have they in the process renegotiated those or have the pipelines come up with we don't have the market to sell that volume at that price and been able to bring those down?

Mr. Arnold, you're shaking your head.

Mr. ARNOLD. No, I have not been contacted and I don't know any of the people we work with who have had gas purchasers come back to them with an offer to or desire to renegotiate.

I know that any new contracts that are being offered, if there are any to be found, have significantly reduced take-or-pay provisions on the order of 25 percent.

Senator NICKLES. The take or pay is 25 percent?

Mr. ARNOLD. Yes, some of the new contracts that are being offered.

Mr. POTTS. Or none?

Mr. ARNOLD. Or none.

Senator NICKLES. Or none. Do they also have, what, market-out provisions if they can't find the buyer for the gas?

Mr. ARNOLD. Yes. There's all types of new innovative ideas in the contracts, such as a flat price but no take or pay provision. I've heard of flat price of $3 for section 102 gas with the offer to renegotiate Janaury 1, 1985.

I think the pipeline companies and the producers can work out the take or pay problems on their own, given time and given a pickup in demand, which is bound to occur.

Senator NICKLES. Do you have take or pays on old gas contracts?

Mr. ARNOLD. No.

Mr. CUMMINGS. None of ours; on some old contracts, but it depends on how old you're talking about.

Mr. POTTS. Pre-77?

Mr. CUMMINGS. Pre-77?

Senator NICKLES. Yes.

Mr. CUMMINGS. Yes.

Senator NICKLES. Would that be on any 104? Do you have any take or pays on 104?

Mr. CUMMINGS. We don't happen to have any take or pays on 104 ourselves.

Senator NICKLES. Mr. Arnold, I wanted just to touch on it, I think I heard you say that the new gas cap would also be subject—107 gas would be subject to the new gas cap, and that's not really——

Mr. ARNOLD. If I said that, Senator Nickles, I didn't mean to. The way I understand it now, section 107 gas is excluded from the gas cap and is given a price freeze.

Senator NICKLES. That's correct.

Mr. Arnold. My point was simply, that it seems to be the section 107 producer is receiving some sort of a bailout by having their price frozen at what is, according to market clearing levels, an artificially high price, while the producer of sections 102 and 103 gas receives a reduction in revenues pursuant to the gas cap.

It just doesn't seem to be a very fair treatment to the producer.

Senator Nickles. Mr. Cummings, you mentioned one objection that you had, under present NGPA, 102 and 103 price controls would expire January 1, 1985. Under the administration's bill, there would be some limitations on that category of gas and other categories of gas, what we call new gas, through January 1, 1986.

Would you want to elaborate on that?

Mr. Cummings. I think perhaps Mr. Potts spoke to that issue in part, and that is that the present conditions in the foreseeable future probably encourage or present a more favorable condition for this process to take place.

I think extending it beyond January 1, 1985, is undesirable in that respect. I realize that there is an attempt here to increase an adjustment period, but I can't really see the purpose, I mean, the support for that extension.

So I would prefer that we see all of these terminate with the January 1, 1985, as was originally set down in the NGPA.

Senator Nickles. I would agree with you, but that would skew a lot of the administration's plan as far as the—they're trying to give producers and pipelines I guess a year or so to renegotiate, and if the cap does, in fact, come in at less than what the present prices are, that's their club over the head to renegotiate prices, kind of what it boils down to, and with that idea in mind, thinking if prices are renegotiated, we're going to be closer to a market price and you'd have that. If you eliminate—if you went back, which I would like to see—I am concerned about—I want to see as rapidly as possible deregulation of all gas, and presently we have a lot of gas that would be deregulated by January 1, 1985, that, in effect, we're extending that control over that period of time.

If we do end up coming with January 1, 1985, for total deregulation of gas, then we will have to make substantial changes in other parts of the administration's proposal, which possibly could be done. It might be easier said than done, but it might be something we'd have to work on.

We've discussed and you all have discussed quite adequately, I think, some of the shortcomings in the bill, particularly the gas cap, what that could do to independent producers, particularly if the gas cap comes in at a level substantially less than the current market prices, and if the person, in effect, was not successful in renegotiating a price, that would be back up in the $3.30 range, to take your example.

Given some of the shortcomings as you see it, all of you also mention that you'd like to see a deregulation—I believe was said, I am not positive Mr. Arnold said it—of all gas, including old gas, as soon as possible.

Given that, is the objective—and could be or would be accomplished by 1986—are the negatives with the gas cap, with the 70-percent rollback on take or pays, with the passthrough limitations, et cetera, are the negatives in your opinion too great a price to pay for the eventual decontrol by January 1, 1986, or something that Congress should just try to work on to make a better bill if we're faced with it in this present situation? Do you have any comments?

Mr. BUTTRAM. Senator, the comment I would make is we have to get realistic with what—I've got the proper word, but I don't dare say it—the opponents in Congress who say if we try to do it by January 1, 1985.

I think the atmosphere of Congress is probably more prevalent to anything else that we're talking about here, if you think that that could be done.

Senator NICKLES. Well, even outside the January 1, 1985, but—all right. Let's go back to the January 1, 1986. Would the administration's bill, given the negatives of the gas cap, given the negatives of the one party opt-out, from your perspective, would you rather see NGPA go its course as it is today and with perpetual controls on old gas and that inequity or would you rather see us move forward with the administration's bill that would have total decontrol January 1, 1986?

Mr. BUTTRAM. I am for total decontrol.

Senator NICKLES. Even if you had to have a little contract interference and a gas cap interference?

Mr. BUTTRAM. We must get back to the free market system some way or another, and that's why I made my comment about what really will be acceptable in the atmosphere of Congress, but the ultimate objective must be decontrol.

Senator NICKLES. Mr. Arnold.

Mr. ARNOLD. That's a very good question.

Senator NICKLES. It's a tough one.

Mr. ARNOLD. I think that for our company's particular situation, in case you haven't figured it out, we have primarily 102 and 103 priced gas, and if we experience a drop in revenues, it'll hurt us quite a bit.

In light of that, with the President's proposal as it now stands, if there—if it would be passed as it is today, I would rather see a continuation of the NGPA with a repeal of the Fuel Use Act and some modification of it to deregulate all gas at some point in time in the future.

Senator NICKLES. OK. Mr. Potts.

Mr. POTTS. I do not agrete with Mr. Arnold in the sense that I—if I have a choice between the President's proposal, the administration's proposal as it is with all of the drawbacks, I would much rather have that than the continuation of the NGPA. I think the NGPA will be changed.

Everybody, either the consumer or what have you, has come to the conclusion that it has not worked. The aberrations of that bill have caused many people to go bankrupt who invested heavily in drilling below 15,000 feet. Had not that provision been in that bill—I would grant to say that there are many drilling contractors and many substantial independents who would not be in the financial shape they are today but because of the NGPA.

I think that the bill is workable with some slight changes, which I think are attainable in light of the three principles that the administration has set forth. I think the old—to me, the biggest problem that you're faced with is how to deal with this old gas, pre-77 gas, and one way I might suggest that you consider doing this, and this would honor the sanctity of the contract, is let the existing contracts run; deregulate on a time certain, but let the contracts run.

There will be a phaseout of different times with these contracts, all of which are usually 20 years, but if you allow these contracts that are now in existence that were entered into in good faith to run their course, there will be a gradual phaseout.

At the same time, we have 3 trillion cubic feet of gas surplus now. If we wait and delay this process and get ourselves into a bind, then we can't do these things.

The conditions are ripe right now for moving swiftly, but the bottom line is, sir, that the administration has come forth with a time certain on deregulation with some slight changes. I would like to recommend strongly that we push forward to get the administration's bill enacted quickly.

Senator NICKLES. Mr. Cummings.

Mr. CUMMINGS. Senator, I would concur with that view. On an either/or basis as you presented it, I would have no hesitation to accept the proposed bill. I think Mr. Arnold's suggestion of the NGPA continuing with certain other considerations of the removable Fuel Use Act and so forth is certainly speculative, but, as I say, on an either/or, this is very definitely a move in the right direction, and I would assume there would be serious effort made to maybe make some changes in the bill or to modify it to deal with some of these issues that have been presented through the hearing process.

On an either/or basis, I don't think there's much choice.

Senator NICKLES. Hopefully there won't be any either/or because I think most people recognize or have a strong desire to see some changes made, but I would also concur that I think most people, economists and other energy people, too, very much would agree on the goal, and that would be for decontrol.

The timetable and the type of controls before we get to ultimate decontrol is to a large degree the focus on the debate. Mr. Arnold. Cummings, excuse me.

Mr. CUMMINGS. I might add at this time for credibility's sake, that continuation of NGPA in our specific case based on present conditions is more favorable to us, but all of us have to think in terms of the overall in the future, what market we operate in the future as opposed to what does this do for me today, and as I mentioned in my comments, there will be no question that whatever approach is taken to decontrol, there's going to be problems, dislocations, financial hardships and whatever, but we will never come up with a solution to that, and I think this, therefore, is much more acceptable than this NGPA situation where——

Senator NICKLES. How do you respond or anybody—I think Mr. Arnold made a good comment and I've heard it several times. I heard it last night and yesterday. The argument, well, this would benefit the majors more than independents because independents are in deep gas and the majors are in more—have more—greater reserves in the old gas, 104 gas. Is there potential they might gain more than indedependents might gain? Would you care to address that? If you don't, that's——

Mr. POTTS. I hate to see us get into majors versus independents because we have a difficult problem as it is in the energy industry combatting the proponents we have from the nonproducing States. I really dislike using majors versus independents.

It so happens that a certain segment of the industry owns old gas reserves and therefore would benefit from what appears to be an increase of the price substantially. That's why I think allowing contracts to run would take care of part of that problem. I really dislike getting one segment against another part of the industry—the overall industry.

Senator NICKLES. I appreciate your comments.

Mr. Arnold, did you have a final comment?

Mr. ARNOLD. Yes. I'd like to first of all clarify myself among my cohorts here, whose opinion I cherish.

Given the alternative between NGPA and the President's proposal, with some modifications, I'd certainly chose the President's proposal—I think the NGPA was doomed from its inception.

In answer to your question about the majors versus the independents, it gets back to my main gripe. As the proposal stands now with the gas cap, what you have is a transfer of revenues from the independents to the majors. As the old gas price is brought up, the new gas price is brought down.

I think there can be some modification of that and I think that Washington, as it's been said here, has enough lawyers that somebody can think of some way to prevent that from happening so that the independents can keep on drilling wells.

Senator NICKLES. Mr. Buttram, any other comments? If not, gentlemen, thank you very much for your input and expertise that you've provided. Its been very enlightening.

Mr. ARNOLD. Thank you.

Mr. BUTTRAM. Thank you.

Senator NICKLES. On our next panel, we have Mrs. Vella Hill, Mr. Lester Goldsborough, and Mr. Gene Hooker, and we welcome you before the committee.

Mr. Hooker, do you care to proceed?

STATEMENT OF GENE HOOKER, ON BEHALF OF THE ALLIANCE ON AGING

Mr. HOOKER. My name is Gene Hooker. I have served two stretches in the Silverhaired Legislature. I represent the Alliance on Aging and I am a special representative of 15 senior citizens in the metro Oklahoma area. That represents a half a million senior citizens in the State of Oklahoma and they're concerned about the cost of gas.

We're concerned whether people eat or heat. We certainly understand that the producer, pipeline and the gas company, who is the retailer, Oklahoma Natural Gas in this area, that they have a problem, but the consumer and especially the senior citizen are certainly entitled to consideration.

I am certainly not an expert in this field, but if I make no other point today, I think a fair solution for all concerned, including the consumer, who after all does pay the bill, should be found.

Comparisons have been made between the gasoline price and the natural gas price on supply and demand.

The one fallacy in that thought is that when gasoline prices go too high, we leave the car sitting in the driveway. When the temperature goes to freezing or below, we don't have any choice except to turn up the heat, and also a point was made a moment ago about the number of people who are senior citizens who draw small royalty checks to help pay their—help supplement their social security. I happen to have come in contact with a lot of senior citizens in recent years and I haven't found too many that's getting royalty checks at all, just social security or other small income to help pay their utility bills, their food bills and so forth.

Now, this doesn't have to be a fight between the majors and the independents or between the consumer and the producers or pipelines and the gas company, but there should be a fair solution, and not being an expert, I have no solution, but I feel that the Senate and the Congress—and the experts in the field and the lawyers that are in Congress and that's why we sent you, Senator Nickles, to Washington along with Senator Boren and our other representatives in Congress which represent the people of the State of Oklahoma, and I am certainly not going to try to pick a fight with the oil people, but my point in being here today is to raise the issue of the consumer has a right to be represented in this hearing.

Senator NICKLES. Well, certainly they do have a right, and I appreciate your participation in the hearing.

Mr. Goldsborough.

STATEMENT OF LESTER GOLDSBOROUGH, ROYALTY OWNER, ARKOMA BASIN, OKLA.

Mr. GOLDSBOROUGH. Yes. I am Lester Goldsborough, royalty owner in the Arkoma Basin in eastern Oklahoma. Approximately 50,000 royalty owners are affected by the old contracts in the Arkoma Basin in eastern Oklahoma.

Senator NICKLES. 50,000 did you say?

Mr. GOLDSBOROUGH. I'd say approximately 50,000 royalty owners in eastern Oklahoma in the entire Arkoma Basin. We are affected by the old contracts. Naturally, that is our concern, however, we do realize that natural gas affects the entire economy of our entire Nation and therefore everyone is affected by it, however, I guess we all react more the way we are affected directly, and so naturally we are greatly affected by the price of natural gas in the Arkoma Basin due to the old contracts, and as I said, probably I can present a problem, but I don't know the answer, and we trust you with the expertise to do it.

I've been the principal of an elementary school for 30 years and I can design a program for any child that walks in the front door because that's my duty and my responsibility, and I think the people of the Nation hold you and the people in Washington responsible, and I feel like you're very capable of doing that.

We appreciate the opportunity for this input into it. But my thought is this—we keep talking about gas cap. If we ask for Government regulations, we might have a gas cap. I understand the gas cap puts a ceiling on it. I remember Governor Marriott one time put a base under oil when it was 5 cents a barrel, and naturally I am concerned. I wonder if there couldn't be some base and some renegotiation in these old contracts.

As royalty owners, we were poorly represented by the producer and the purchaser, which the royalty owner has no input whatever into the price or the contract of natural gas, and I'd never heard of the term renegotiate or escalate and I don't think any of the other royalty owners had. So therefore we were vulnerable to whatever contract we signed with the oil companies, and if there is a run in those old contracts, and I hold contracts sacred, I wouldn't want them to come by and want to renegotiate the contract on my house and raise the interest rate, but if there is a run, there's a remedy somewhere, Senator. It affects approximately 50,000 royalty owners in the eastern part of Oklahoma, and I'm sure throughout the Nation there must be others affected by this, and I believe if there is a wrong, there should be a remedy to correcting it, and if you can put a cap on it, then I believe we should have some input and some renegotiation into a base on it.

Senator **Nickles**. We appreciate your comments.

Miss Hill.

STATEMENT OF VELLA L. HILL, ON BEHALF OF THE OKLAHOMA COALITION FOR OLDER PEOPLE; THE CAPITOL HILL CHAPTER, ASSOCIATION OF RETIRED FEDERAL EMPLOYEES; AND THE FLOWER GARDEN PARK NEIGHBORHOOD ASSOCIATION

Ms. **Hill**. I am Vella L. Hill and I am representing the Oklahoma Coalition for Older People and the Capitol Hill Chapter of the Association of Retired Federal Employees, and my neighborhood association, which is Flower Garden Park Neighborhood Association here in the city, and it's in the near Northwest section, which is an older part of the city, and a good 40 percent or more of those people are in the elderly category. I am also a member of the Silverhaired Legislature.

I do not have a prepared statement because I didn't learn the time that you would be here until last night. I did not have time, but I do want to say this.

Our elderly people are very concerned about all the increases in prices, and not only utilities, but everything else, and I am older than you by far and older than I think most of the people in this room. I can remember after World War II, they had put regulations on different things, food and I don't know what all, but when they began to take the prices off those things, the prices skyrocketed. After a time, maybe several months or even a year or two, the price came down, but it was raised.

In the same way after World War II, there were regulations on rents and different foods and things, and when they took those off after the war, the prices skyrocketed. I have a feeling that the same thing will happen if gas is deregulated. During the time that they were working on this regulation, I happened to be serving on a consumer affairs committee to the—well, it was an advisory committee on consumer affairs to the Department of Energy, which has been abolished, and we discussed those regulations in these meetings that

I attended, and I became pretty familiar with them, but I didn't have time last night to get any of that information out but it's all available. I'm sure you have seen those reports and it affects every person in our country. It affects every elderly person, and our elderly people are increasing rapidly as I think you know. When these people talk to me, they say, "Well, I don't believe that the people in Washington have any idea what the people are suffering" and they think that all they're doing is setting up something for the wealthy people, and the people that I represent are not wealthy. They're all working people or have been working people.

Among our elderly people, there are great numbers of widows, far more than there are among the working people, and the widows are having a terrible time. Now, I happen to be one myself, but I am on an annuity from the Federal Government, which gives me a little bit more than most of the widows on social security, but even with me, it's difficult at times for me to find the money to pay my bills.

Now, our gas bills this year are running a third or more higher than they were a year ago, although it has been a warmer winter than it was a year ago, and I've had people tell me their gas bills were as much as $180 and $190. I don't have a bill like that because I have a small five-room home and I don't have those large bills, but a retired person can't pay those kind of bills, and Mr. Potts, I believe it was, made the statement that the gas company was averaging the bills for the consumer.

I want to correct him a little bit on that. They are averaging them for those below poverty level. People above poverty level are not averaged, and the people who are being averaged, there's quite a lot of them that do not do that because they feel like if they do that, then when their electric bill goes up in the summer for cooling, they're overlapping and they can't afford that.

So they're trying to pay their gas bills as they come and the electric bill the same way, and with some of our really low income people, it's pay my bill or eat. If it's cold, they try to pay the bill, and they cut out a meal a day or they go to a senior citizens center where they can get a cheap meal or something like that. And those are just some of the things that the elderly people are suffering.

Now, a lot of the organizations serve certain classes of people. With the Oklahoma Coalition, we serve those that are not served by anybody else. We try to help those people that are not members of any organization, not being served otherwise. I appreciate you having us here and waiting here and giving us a chance to talk, because I didn't know about it in time to let you know ahead of time I wanted to come. I've corresponded with you a number of times, but I had never met you face to face.

Senator NICKLES. We appreciate your participation as well as the other panelists for your input. I think it is important. I apologize for the fact that you didn't hear about the hearing before. We send these things out and sometimes you might catch it in the paper or might not, but we do appreciate your input.

If you do have some additional comments that you wish to have inserted as a formal statement or something like that, that would certainly be part of the testimony and we would make that part of the record.

I might just ask a couple of questions. I noted from some of the comments that were made, concerned the ability of persons to be able to pay their bill. The cost that many people are faced with, economic cost, particularly in light of the fact that they see their fuel bills going through the roof, whether it be natural gas or—in the eastern part of the country it's fuel oil in many cases is burdensome.

Ms. HILL. There's one other thing that I might say. When I was in Amarillo, visiting my brother at Christmas time, he told me that his December bill had been $46, and no year previous to this year had he ever had a bill more than $9.

Now, Texas has always been known as having the lowest rate of any State in the country, I think, but apparently they're going to raise it up.

Senator NICKLES. I'd like to know how he got by on $9.

Ms. HILL. That was the rate out there. He wasn't the only one. There were many people that had low rates like that.

Senator NICKLES. I think part of your comments kind of illustrate the fact that the NGPA as it is today is not really working because we've had several people that are in the business, producers, et cetera, saying their prices have been falling substantially, but the current rules and regulations that we find ourselves entangled in do not really allow the marketplace to work to get those lower prices to the consumers; in many cases are counterproductive to helping the consumers actually receive the benefit as compared to, say, oil, when oil was deregulated. We have seen a substantial decline in oil prices and, conversely, we've seen a decline in prices at the pump, which has benefited consumers. I also do appreciate, Mr. Hooker, your comments.

There are differences between various sections of the country regarding the necessity for the use of natural gas for heating and therefore there has been some Government assistance. Low income energy assistance is designed to try and help buffer some of the hardships people have been experiencing.

Mr. Goldsborough, do you wish to say something?

Mr. GOLDSBOROUGH. One other comment. As I said, we react the way we're affected by things, and the old contracts in the Arkla Basin are on old wells that were drilled 18 or 20 years ago. Then there's new wells that have been drilled the last few years, and the companies have had to pay a higher price, of course, for the new wells, for the new gas than they do the old ones. Yet they shut the new wells down only for 1 day a month. They require to turn them on for 1 day a month. They come out, turn them on for 1 day a month, shut them off, and yet they pull the old wells at full capacity all the time.

Now, if they were making the same percent of profit off of the old wells as they are the new ones or the same percent of the new ones off the old ones, then they would be taking the gas out of the new wells same as they are the old ones. So there's an inequity somewhere that the old wells are in full production almost all the time and the new ones, when there's an oversupply of gas, they come out and close them off.

Senator NICKLES. I appreciate you commenting on that because much of the testimony we've heard has been just the opposite. They say they've been running the higher priced wells and shutting in the cheaper ones.

Mr. **Goldsborough**. Why would they run the higher priced wells when they can take the gas at the cheaper price? This goes on at approximately 60,000——

Mr. **Hooker**. Senator, I might cite one other inequity. I was in Houston, Tex., at the first of this month; big headlines in the Houston paper that the price of gas to the consumer is going down in Houston, Tex., definitely going down by 10 or 15 percent.

I don't claim or I didn't claim to be an expert—I don't know how many experts—they say an expert knows nothing about everything or everything about nothing, but anyway——

Senator **Nickles**. We have a lot of those in Washington, D.C.

Mr. **Hooker**. The thing that seems so absurd to me as an observer and a consumer that has to pay my gas bill every month or get cut off, regardless of what it is, that there can be a lowering of price 800 miles south of us in whatever part of Texas, but I do know that instance, but something is wrong in the woodpile and I just hope you and the other Senators and the other Congressmen and the President can get this thing worked out so it will be fair to everybody.

I am for everybody making a profit when they sell their product. I sold myself for 40 years and if you didn't make a profit, you just don't stay, but still the person that pays the bill, and that's us, the consumer, must be considered in the long run or you don't have any consumers. If you price them out of the market, you just lose them. That's all there is to it. Even though you have to have some heat, there are people that will heat instead of eating. The gas consumption will go down if the price gets too high, there's no question about it.

Senator **Nickles**. That's true.

Mr. **Hooker**. Even though you have to have some of it. I appreciate you inviting us in at this late moment of the proceeding even though the agenda was set and letting us have our input, and I just ask that you and the members of your committee get the message to the President and all this crowd around about what's going to happen and that the consumer be given a fair shake.

Senator **Nickles**. I appreciate that and I very much appreciate the input that all of you have had. Miss Hill.

Ms. **Hill**. There's one more thing. I have had it suggested to me since they began to talk about the deregulation, well, if they do that, would they set in some level where they would not raise the elderly people above a certain level? That's just a thought.

Senator **Nickles**. I appreciate your suggestion.

Ms. **Hill**. I couldn't say whether I know how to operate it or anything, but it's a thought to think about.

Senator **Nickles**. The way the program—the low income energy assistance is not set on age but set on income.

Ms. **Hill**. That's right.

Senator **Nickles**. There again, to provide assistance for those that can't take care of it themselves, and that's probably—I think if I was going to give you a guess which way I thought Congress would go, I think you'd probably see maybe some greater input or assistance in that area to help those that cannot help themselves, but it wouldn't be on age; it would be on——

Ms. **Hill**. But they forget about those that are just a few dollars above that poverty level and we've got more of those I think than we have below poverty level.

Senator Nickles. It's a good point. I appreciate you making it very much. Thank you all.

Our next and final panel that we have is Gene Knight, who is president of Midwest Exploration Co., Bill McDowell, who is a gas contracts specialist for Hadson Petroleum in Oklahoma City, and Gene Lamb, who is manager of gas activities for Continental Oil Co., and I think joining the panel in a few moments will be Dave Cordell.

Gentlemen, we welcome you before this committee, and though you may be batting cleanup, we consider your input very important and appreciate you taking the time out of your busy schedules to share with us your thoughts on the various legislative proposals and, again, I guess I'll repeat myself.

I probably should bring up some of the other proposals, too. We focused primarily on the administration's bill, which I think is certainly correct to do so, but it's also, I think, advantageous to touch on some of the other proposals that are before Congress, too.

So, Mr. Lamb, would you care to lead off?

STATEMENT OF GENE LAMB, MANAGER, GAS ACTIVITIES, NORTH AMERICAN PRODUCTION CO., CONOCO, INC.

Mr. Lamb. Yes, sir. My name is Gene Lamb. I am manager of gas activities for North American Production Co., North American, department of Conoco, Inc. Conoco is a company with deep roots in Oklahoma and has a major stake in its future. Natural gas is an integral part of our operations here and we certinly welcome this opportunity to comment on implictions of pending natural gas legislation.

Conoco is both a major producer of natural gas in Oklahma and a major consumer of gas in our Ponca City refinery. Our gas production here at an annual rate of over 29 billion cubic feet represents 12 percent of our domestic total and covers most of the NGPA gas categories, including decontrolled deep gas.

Our interest in natural gas legislation is therefore typical of most of Oklahoma's historical producers. We have participated in deep drilling ventures that deregulated priecs as permitted by provisions of the Natural Gas Policy Act, but we also have signifiacnt reserves of old gas that remain regulated under the Natural Gas Policy Act. The future value of these holdings is uncertain under current regulatory structure.

Since the Phillips decision in 1954, the price of gas destined for interstate markets has been regulated, first by the Federal Power Commission, later by the Federal Energy Regulatory Commission. For most of that time, political pressures have kept the regulated price of gas below market clearing levels. This led during the 1970's to significant shortages of gas in regulated interstate market.
kets, shortages are quickly eliminated by rising prices. Surplus is eliminated by lower prices. Good examples of this self-equalizing tendency were the unregulated Texas and Oklahoma intrastate gas markets of the early 1970's. In those two areas, these shortages occurred in the winter of 1973 and 1974 but were quickly eliminated by

rising prices and increased exploration of production activity. Chronic shortages in the regulated market became prevalent in the 1970's and were especially severe in the abnormally cold winter of 1976 and 1977.

Congress could have opted for wellhead decontrol to eliminate those shortages, but instead arrive at a complicated political compromise which promised only partial deregulation by 1985. This compromise was the Natural Gas Policy Act of 1978. Under the Natural Gas Policy Act, the regulation of wellhead prices was extended to include the previous well functioning, nonregulated intrastate markets.

Essentially, the Federal Government rated the intrastate gas production in the principal producing States, such as Texas, Louisiana, and Oklahoma, to help compensate for Government induced shortages in the interstate market.

There is no point in describing the NGPA in detail. We all know that because the price of gas was increased, the NGPA initially spurred exploration and development of new gas supplies and substantially increased deliverability from existing reserves.

However, over time these gains have been offset by serious disproportions stemming from the Natural Gas Policy Act.

I will concentrate my remarks on three. One is the instability in the natural gas markets. Two is the take or pay provision, and three is the indefinite pricing escalator issue.

The NGPA has led to mounting instability in natural gas markets. With the shortage of the mid-1970's seared in our memories, pipeline companies were anxious to establish claims to reserves and future supplies. With most domestic gas supplies under price controls after passage of the Natural Gas Policy Act, the pipelines competed for regulated supplies by offering increased contract quantities, which resulted in take or pay quantities that would have been difficult to maintain even with unlimited demand. The pipelines competed for the limited volume of deep deregulated gas by offering higher prices than the gas could command in the marketplace.

In the Anadarko Basin, for example, this led to a deep gas drilling boom from 1979 to 1981 as prices reached over $10 per thousand cubic foot. Rolling in pricing by the pipelines allowed them to use their cushion of low price gas to pay in excess of market clearing price for deep gas. But the inevitable depletion of this cushion of old gas combined with the downturn in the economy and the temporary gas bubble we're experiencing has sent deep gas prices plummeting and places many deep drilling projects in economic jeopardy.

This NGPA induced boom or bust phenomenon has created problems for states such as Oklahoma, already hurt by the general economy. Take-or-pay contracts have become a controversial issue because of their alleged link to rapidly rising gas prices.

Historically, take-or-pay contracts were designed to assure gas market stability and facilitate debt financing. However, the NGPA induced pipelines to engage in nonprice bidding in order to secure additional supplies. With prices being controlled, pipelines outbid one another by agreeing to higher than usual take or pay contracts in the range of 85 percent rather than 70 to 75 percent.

Some pipelines have shut in lower cost old gas to take higher priced new gas because most new gas is subject to these owners' take-or-pay provisions and the pipeline company can pay for a much larger volume of gas not taken at low prices.

In some situations, the ratio can be as much as 20 to 1. This is the situation where—pre-1973 gas is like 45 cents a thousand cubic foot, where you have deep gas as high as $10. So you have a 20-to-1 ratio, and this is significant when they start figuring up how much gas they're going to have to pay for and not take.

What should be noted here is that it's the NGPA pricing regulations that are inducing this behavior and not the take-or-pay provisions, per se. I want to emphasize, however, that it's erroneous to assume that problems with take-or-pay provisions are a major factor in curent gas price increases. Various studies indicate that more than half of the recent increase in residential prices is due to increased transportation and distribution costs, not to price increases at the wellhead.

For instance, the Department of Energy estimated that for the September 1981 to the September 1982 period, the residential price of gas increased 92 cents per thousand cubic feet; however, only 45 cents of that increase was pivotal increase at the wellhead. The 47 cents came from added transportation, distribution and imports.

Of the 45 cents attributable to wellhead price, rising prices under the NGPA, replacement of depleting, old, less expensive gas for more expensive new supplies account for the majority of the increase.

In addition, an accumulation of the take-or-pay payments as purported by the interstate pipelines in their NGPA filings total slightly in excess of $700 million. This would equate to less than 6½ cents per thousand cubic foot on the annual production to the interstate market.

Therefore, legislative dissolution of take-or-pay provisions in contracts will do little to solve the basic problems besetting natural gas markets. It would, however, lead to unacceptable Government interference with private rights exercised in contractual processes. A final NGPA disproportion worth mentioning pertains to the indefinite escalator clauses.

In the late 1970's, the pipeline companies remained apprehensive about natural gas reserve shortages. In addition to offering higher than usual take-or-pay contracts, they agreed to other nonprice, noncontractual terms, such as escalator clauses, to obtain long-term gas contracts.

Pipeline companies agreed in negotiations with producers that if and when deregulation were to occur, the gas under contract would be redetermined to the current market price or alternate fuel values, a price which might exceed some buyers' ability to market the gas.

The deregulation clauses in these contracts vary widely. What has caused so much controversy recently is the fear that an unknown amount of gas might suddenly be elevated to alternate fuel, the alternate fuel value levels when partial deregulation occurs in 1985. Here again, it is not the producers or the pipeline companies who have acted irrationally; rather, the problem lies with the extreme complication of NGPA pricing regulations which have created artificial levels of prices totally unrelated to the market value for Btu of energy.

Because of these and other disproportions caused by wellhead price controls, Conoco has long advocated a free competitive market for natural gas to wellhead. We recognize that the transition to such an environment requires compromise by all affected parties, including ourselves as a producer.

With this in mind, we have concluded that the administration's proposed legislation on natural gas merits our support. Certainly there are parts of the bill that will have an adverse impact on Conoco and other producers.

For example, the gas company under present supply and demand conditions will reduce the price we receive for new gas; however, we recognize that the bill is a very rational attempt to balance the competing interest of the participants in the natural gas market.

We're not insisting the specific provisions in the bill having an adverse impact on us be altered before we can give our support; however, there are provisions that can be modified or improved upon to carry out the intent of the administration.

We believe attempts to amend the bill materially by ourselves or others would jeopardize its overall positive impact and reduce the hope for broad-based support. I believe this legislation will benefit consumers, distribution companies, pipelines, and producers. It will introduce competition to the natural gas markets between pipeline companies and with alternate fuels.

I firmly believe that the removal of wellhead price controls will introduce levels of competition to the natural gas market sorely needed to alleviate existing problems. This competition will insure that distributors, pipelines, and producers operate in a more efficient manner, thereby insuring adequate gas supplies at the lowest prices to consumers.

Now let me mention why we believe the administration's proposal will work. Consumers will be protected by a gradual transition to a decontrolled environment. Such protection will result in the combined effects of several provisions. Section 101 limits until 1986 the automatic passthrough of price increases by pipeline companies. Section 203 establishes a cap on prices of nonrenegotiated contracts. Distribution companies are also protected by section 101.

This segment of the industry has long complained that pipeline gas acquisition prices do not reflect market conditions, leaving to the distributors the burden of marketing high priced gas. Section 101 insures that market signals are reflected from the burner tip back to the wellhead.

The pipeline companies have complained about the adverse effect of contract provisions such as take or pay and indefinite price escalators. Section 102 will allow pipelines to reduce their take or pay pipelines after 1984 to terminate contracts that had indefinite price escalators.

Finally, the producers will benefit from section 303, which allows it to improve values under contracts which do not reflect current market conditions after 1984, and from section 401, which insures that the producer is able to move this gas to market. These provisions allow the producer to develop the least expensive gas reserves first instead of reserves that obtain the high prices created by the NGPA. This naturally will prove to be a great benefit to consumers as well.

All of these benefits are not without their potential or actual cost and risk. I have already mentioned the reduced producer revenues from new gas resulting from the gas cap. Producers will also have to tolerate some difficulties from reduced take or pay levels. Pipelines will be affected by temporary limitation on passthrough.

The consumer will be called upon to exercise his choice in a free market environment. I believe a free market for natural gas will prove to be in the best long-term interest of the consumer and the Nation in years ahead.

The point I want to end on is that if each affected group because of some near term impairments or uncertainties is reduced to protecting just itself, the needed comprehensive solution to our gas problems will not be found. Instead, we will regress to policies emphasizing government controls that are proven ineffective and have led to our current difficulties; a decline in reserve life from 13 years to 9 years over the past 10 years, which is a decline of 30 percent. Neither natural gas consumers nor producers nor the Nation can afford this to happen. The administration proposal offers us our best opportunity to move to a free market and thus to greater assurance of adequate future supplies and realistic market values. Thank you.

Senator NICKLES. Thank you very much, Mr. Lamb.

Mr. McDowell.

STATEMENT OF BILL McDOWELL, GAS CONTRACTS SPECIALIST, HADSON OIL

Mr. McDOWELL. Thank you, Senator Nickles. My name is Bill McDowell. I am a gas contracts specialist with Hadson Oil, a small independent producer. Without commenting on specific points of the President's proposal, I would like to point out some of the problems that Hadson Petroleum as an independent producer is experiencing in the present gas market.

Under NGPA, we negotiated contracts under which we drilled or participated in approximately 400 gas wells in Oklahoma and Arkansas since 1977. These wells were drilled under acceptable business risks because we were able to forecast with reasonable accuracy the price that we were going to be receiving. In 1979, 1980, and 1981 we received clear signals, and I would emphasize clear signals, from the pipeline purchasers that the industry was desparately seeking to add reserves, which at that time were declined.

These signals were in the form of contracts being negotiated between the pipelines and the producers, with increased prices where applicable, say under section 107, and favorable production rates with favorable take or pay clauses. The favorable producing rates allow a producer to get back his investment faster. Large sums of money were invested in the search for these adequate supplies to alleviate the shortages say of 1976 and 1977.

It is our position that these contracts must be complied with in order for Hadson and others like us to recover, in Hadson's case, approximately $2 million that we have invested over the last 4 years to develop some 60 billion cubic feet of reserves.

Now, it doesn't take a genius in higher mathematics to get that out real quick, and that's something like $3.30 a thousand cubic foot that we've put down in the ground to develop some 60 billion cubic feet of reserves. This is very high priced gas. Most all of it is either section 103 or section 102 gas, which are the two top regulated prices.

At the present time, we are experiencing a considerable amount of difficulty in obtaining new gas contracts for any gas regardless of the category. At the present time, we have five wells. I believe I heard someone mention before that they had some wells. We completed these gas wells in the latter part of 1982 and they're good gas wells and they're surrounded by gas pipelines. Some of them are less than a mile away from a gas pipeline and we have received no contract offers at any price for these five wells. The latest offer that we have received is for—is an offer for less than the section 103 price. This is for a deregulated section 107 well. We received an offer for less than the section 103 price.

Senator **Nickles**. What was that offer, do you remember?

Mr. **McDowell**. It was for $2.70.

Senator **Nickles**. And that was for a well that was greater than 15,000 feet.

Mr. **McDowell**. Greater than 15,000 feet.

Senator **Nickles**. $2.70?

Mr. **McDowell**. Yes.

Senator **Nickles**. How recent was this?

Mr. **McDowell**. I have it on my desk right now. We haven't signed it yet. It's a flat rate for 2 years or until January 1, 1985, at which time there will be a renegotiation. The contract has no take or pay terms in it. It just says we'll take it on the best efforts, and all of us who are producers know that's going to be the first well shutin when supply is too much, and I would say for the last 6 months we have been receiving contracts with either vastly reduced—say in the 25 percent of deliverability take or pay range or just on the best efforts basis, ratable take basis. That means that they'll take the same amount of gas that's been produced around you.

We have one other problem that I haven't heard mentioned here today and I—it's a fairly localized problem, but it is caused by the high prices and the increased takes or pays that we were able to negotiate—I say we— as an industry in the past years.

As Mr. Lamb commented, in order to compete for regulated gas and also for nonregulated gas, in terms other than price, there are companies who went out, signed up vast—or pipeline producers would ask you to include a large area in a contract. That particular time that insured them of a fairly adequate supply of gas if that were developed.

The problem that we are experiencing right now, and I say we—we're on both sides of it—is where a particular operator or a particular working interest owner in a well has a contract with a pipeline purchaser, this pipeline purchaser will come out and hook up the well for the account of that working interest owner and will offer—will not offer a contract to anyone else in the well. You say that they have all the gas that they—you know, they've contracted for all the gas that they want to buy, so they produce the well for the account of this one or more working interest owners, the rest of them can get their gas 5 or 6 years from now on down the line. In reality, he's producing the 100-percent well stream.

Senator **Nickles**. How are those contracts written now, Mr. McDowell? If you're in as a part owner, are you trying to protect those part owners?

Mr. **McDowell**. Generally, up until the last 2 years, it hasn't—or the last year, essentially, it has not been a problem, because all the gas was the same price. The larger reserve wells were not being, you know, really found, especially from the deep gas, and the contracts with the pipeline companies don't address it.

Each working interest owner has been very jealous of being able to market his own gas in the past and has reserved the right to market his own gas, which ends up with one or more pipeline purchasers connected to a well. This is usually very acceptable to the producers because you're able to make your choice of whatever contract terms are available.

The problem that is occurring right now is that no contract terms are available. In Oklahoma, we have common carrier statutes. We've recently passed some—our State legislature has recently passed some other common carrier statutes which would require a pipeline purchaser to offer similar contract terms to everyone in a well if they're actually doing it.

In the case of interstate pipelines, they say that the State does not have jurisdiction over this, and we would like for someone in the Federal level if they have—with their jurisdiction up there to maybe address this problem in some way. I can foresee that this problem can go away by itself, that it would be—you know, it's going to be a short-term thing that's happening right now and is not going to happen say 5 years in the future when all the prices would be more equalized.

In conclusion, I would like to say that Hadson Petroleum concurs with natural gas deregulation and we can support the President's bill in all respects except the abrogation of contracts, which we feel that we have negotiated in good faith and that we would be at a decided disadvantage come January 1, 1985, if one party or another is allowed to opt out of a contract.

Senator NICKLES. Do you have some contracts—do you mind me interrupting you?

Mr. LAMB. No, go ahead.

Senator NICKLES. Do you have some contracts where you feel as if the purchaser would definitely be opting out? In other words, you have some high price 107——

Mr. LAMB. Every high price contract I have, even the ones they have exercised their market-out on at the present time, I would definitely feel if this were available, that they would definitely say we're opting out of this contract right now, period, bottom line. You know, that's the nature of the beast, and then you——

Senator NICKLES. Do you have financial commitments to banks or others that——

Mr. LAMB. Horrendous ones.

Senator NICKLES [continuing]. That would put you—let me ask you to put this in a different—excuse me for interrupting, but I kind of wanted to touch on this. We haven't quite focused on this aspect.

Knowing that you had between now and January 1, 1985, to renegotiate with the pipeline or whoever you're selling it to, knowing that that deadline was coming, that would be an incentive for you and them or—possibly not for the purchaser in the case of—if you're selling gas for $8 or $9, but knowing that that time was coming up and that they could opt-out for you to renegotiate with them in the interim period of time, do you feel like that gives them too much of the deck to deal with or——

Mr. McDOWELL. Well, yes, sir, I would say that that really does. The only two offers that I have received at the present time from a pipeline company to, quote, renegotiate a high price contract, and I recognize that these are above the market clearing level. I have received one contract that did not have a market-out clause in it and we're receiving $9.25 or something like that with this contract. I received an instrument from the pipeline purchaser that allowed us to amend the contract to add a market-out clause. That was it, no offer of anything else, just an amendment to add a market-out clause. This company had already marketed out to $5 in areas where they were able to.

The other offer I have received was in a contract that has a market-out clause, but it is not operable until January 1, 1986. It was an offer to voluntarily reduce the price or to waive my right to collect any price above $4.94. That was it. I have offered to renegotiate and add other wells or things with these others. I have received no replies. This leads me to believe that—they say, yeah, OK, we're going to—January 1, 1985, we're going to opt out of this and you're going to get $2.25. We'll give you $2.25 now. That's my personal belief of what would happen, and in conclusion, I think that the abrogation of contracts would set a very dangerous precedent for the Congress to take.

Senator NICKLES. Thank you very much.

Mr. Knight.

STATEMENT OF EUGENE M. KNIGHT, PRESIDENT, MIDWEST EXPLORATION, INC.

Mr. KNIGHT. Thank you, Senator Nickles. I am Eugene Knight, president of Midwest Exploration, a small independent based here in Oklahoma City. While my company is relatively new, my own experience spans some 37 years covering the time when you could read your newspaper by the gas flares in the field to the present setup where you've got a very major, multifaceted industry with many segments in it, with many different problems.

I don't envy you the job you have in trying to correct some of those problems. One of the things that I have noted over that span of time is that the governmental process for correcting imbalances and situations of supply inequities or inadequacies is that the Government process moves too slow. It cannot anticipate and move with the speed that industry normally can respond with. I obviously favor decontrol of the gas price as it applies to our industry, and so far as I have seen, the administration's bill comes as near to being an acceptable document that I have seen. There are others being offered that I'll comment on later.

I'd like to point out at the outset, though, that some of the current chaos in the markets is to a considerable extent the working of factors outside of the producer's end of the gas business. It is probably related directly to the distribution end of the business, and that is the problem raised by the alternate fuels.

I will leave with you a plot of the declining trend in fuel oil prices. It's a graph that I prepared for you. I don't know whether you've seen it in that form or not. It plots the cost of the fuel oil in millions of Btu's where you can make in your own mind a directed comparison to the cost of gas.

When you add to the price of gas the cost of distribution, somewhere between 75 cents probably on the low side and $1.25, which is I believe the DOE estimate, you quickly get gas at prices that won't compete with today's fuel oil prices, simply. It's further complicated by the fact that as of now, I do not see an end to the softness in the fuel oil markets. With what has gone on with the OPEC production and other factors that are at work, I think you're going to see, if anything, a further softening in those prices, which further complicates the gas marketing process. We're losing markets to fuel oil supply.

There is another factor, and that is that there have been a number of permanent losses to the gas industry. I cite Public Steel's plant breakdown near Buffalo, the plant which shut down recently. Both of them are not going to be revived.

I don't care when the recession ends, they're gone, and the sizable gas markets that they afforded are gone. They've been displaced.

I think you'll find the same thing true with a bunch of the automotive industry where supplies were—some segments of our industry have simply priced themselves out of the marketplace, and when they're gone, there's not—right now, there's not a whole lot to take their place. So it's a problem that will affect gas pricing for many months to come.

Part of the problem, of course, is the general recession, but I think the first two factors that I cited are having a more significant effect on the problem than the general recession. We've always had some prophets of doom that say we've already found our last thousand cubic foot, our last barrel, and I saw recently a DOE estimate of 1983 gas consumption showing that we were expected to consume in this country about 19.3 trillion cubic feet.

The First Boston Corp.'s research department just this last week put out an estimate that that is more likely to be 17½ trillion or it could go as low as 16 depending on these oil factors that I mentioned. That is not encouraging news as far as marketing your gas is concerned.

It's already been pointed out that we witnessed a very rapid buildup of supplies in the past 4 years, so much so that there are very few new contracts for gas available on undedicated acreage.

As my compadre here pointed out, they'll offer you best efforts at something like half of a ceiling price and maybe take a little bit of that. I've been negotiating some contracts with different pipelines and that's basically the situation I've run into in trying to negotiate for new supplies that have not been in the market.

I have noticed in watching some of the hearings, particularly in New York and in Washington, that a number of witnesses or panelists come up with some ideas that to me are almost incomprehensible. They want to keep the incentives out here for us to drill. They want us to go, go, go drilling, and yet I don't know where we're going to go, go, go with the gas that we find. We can't market it.

It's true that there has been a marked reduction in the reserve in terms of years of backup on the systems, but for the pipeliners or distributors who are asking for this drilling to resume, they might just as well ask the sun not to come up as they expect a man to put millions of dollars in the ground when he knows he can't market it. For one thing, my banker won't let me do it anyway.

What I am saying, I guess, in a way is there has been a lot of varied comment on the bills that are under consideration and it would almost seem that each segment of the industry is trying to make a case for its own operations. The rest of them go hang.

Well, there is enough interdependence in the working of the overall thing that we can't work that way. What affects one is going to affect the rest of us. And let me inject here one comment about a resolution I saw being introduced calling for a bipartisan national commission to draft legislation to cure the gas problem, a la, the social security fix. I commend you on voting against that. That is doubly faulted in that it is a government fix instead of a market fix, and if patterned after that kind of a cure, it would be like putting a band-aid on a bleeding sore in our case.

There are apparently three alternatives; one, maintaining the status quo, two, deregulate or, three, continue with old plus new regulations.

Now, there have been a bunch of bills proposed to add regulations, extend controls, and that is nothing but an open invitation to future cyclic recurrence of the supply problems that have plagued us in the past.

I appreciated your comments and Mr. Cantrell's regarding the impact of the high priced imports. That has affected me directly in some of my operations. I've got 10 wells shut in in an area where Canadian gas is coming in at $4.94 and where——

Senator NICKLES. What are you willing to sell that gas for?

Mr. KNIGHT. If I could sell it, I would sell it for anything I could get a reasonable rate of return on.

Senator NICKLES. Which is?

Mr. KNIGHT. It would take probably in the range of $2.

Senator NICKLES. Two?

Mr. KNIGHT. I haven't gone that far.

Senator NICKLES. I am not trying to negotiate the contract for you, just——

Mr. KNIGHT. Let me comment on one other aspect. In your proposal, you have an item dealing with the transportation of gas by the pipelines to end users. Well, the buyer of my gas where I am shut in is actively pursuing that idea in my behalf now. It's sort of a switch.

I noticed in the Oil Daily this morning that the Trans-Co is doing some of the same thing. This is being done voluntarily. I think, really, without opening up a new can of worms and creating a new bog of regulations that are probably not administerable, it would be best to leave that kind of thing to negotiations between parties.

On the administration bill, I have one or two other comments. I am like some of the others, particularly Mr. Buttram and my friends with Hadson here; I question seriously the wisdom of contract abrogation. I think it would be best to leave probably the old supply contracts in force until they expire. You're seeing gas depleted under most of those at the rate of 6 to 8 percent on the low side on some of them to as high as 15 to 18 percent on the high side.

They're going to phase out one of these days naturally, either by depletion of the reserve or by the termination of the contract. That seems to be a hangup, part of the problem with the current deregulation consideration. What about the old? Leave it alone. It'll take care of itself with time.

Now, it's been pointed out I believe it was either by Mr. Bergrage or Mr. Lawrence in their testimony in Washington that if you just brought everything up to market price, it would probably cause something like a $25 billion transfer of funds from one segment of the producing industry to another, and I think there's quite a lot of truth in that.

It's already been brought out, and I need not repeat it here, that a large part of that will come from the independent segment of the producing industry, a segment that can hardly stand that kind of treatment, at least if they're going to survive.

I would like to see some things implemented. One is that it's been recommended by nearly everyone here this morning, the end of the old Fuel Use Act provision, which I think you've introduced legislation already, and the other, to be very careful about the way you approach the matter of deregulation of old supplies. I don't think it needs to be done in a way that will cause serious disruption in the marketplace.

I do urge you strongly to try to block any of the House proposals that I've seen that would extend and add to controls. It's an open invitation, again, to a continued shortage. I would also urge you to do what you can to eliminate subsidized energy supplies, whether they're foreign or domestic. We've got a lot of our resources in this country represented by taxes and other things going into a bunch of nonsense of supplies that cannot compete in the marketplace.

[The prepared statement of Mr. Knight follows:]

STATEMENT OF EUGENE M. KNIGHT, PRESIDENT, MIDWEST EXPLORATION, INC.

I am Eugene Knight, President of Midwest Exploration, Inc., a small independent based in Oklahoma City.

Although Midwest is a relatively new company, my own experience in producing and exploration spans 37 years and covers the period in which the natural gas industry in the United States became a major multifaceted industry. I do not envy you the job you have in trying to correct current conditions. Several decades of attempts to regulate by government edict have repeatedly shown that government controls including rigid price controls lead to supply shortages and other market distortions. The governmental process is too slow to react to changes under "normal" times—if you can find any span of time that could be considered normal. At the same time, when national emergencies occur, action may be taken in panic and is quite often faulty, requiring later correction.

With respect to the current problems, I favor decontrol of the gas pricing and so far, the administration measure, while in need of some change, deals with most of the issues.

First, let me point out that the current chaos in the markets is to a considerable extent the working of market factors outside of the gas industry:

1. A marked reduction in the price of crude oil with consequent sharp reduction in cost of fuel oils which are alternative fuels. There is no indication of an early reversal of this factor.

2. There have been a number of permanent losses of markets due to closure of plants of various industrial users. Two examples of this are the Republic Steel Plant near Buffalo and the Bethlehem Steel Plant at Lackawanna. You can pass all kinds of legislation on the price of natural gas without reviving either of these entities. They are gone and their sizable gas market is gone.

3. A reduction in general use of gas because of the general recession.

Of these factors, in my opinion the first two are affecting gas prices more than the latter. Both are unrelated to the producer gas price structure, but both directly relate to how much gas can be sold today, and the price at which it can be sold.

We have always had prophets of doom who have predicted that the last MCF of gas and last barrel of oil had been found. We have a recent DOE estimate of 1983 gas consumption of 19.37 trillion cubic feet. A more recent analysis by the First Boston Corporation's research department indicates 1983 consumption more likely in the range of 17.5 trillion cubic feet, and possibly as low as 16 trillion depending on oil prices.

We have witnessed a rapid build up of gas supplies in the past four years, so much so that there are few new contracts for gas available on undedicated reserves. The few contracts offered are at prices well below ceiling prices and with pipeline options to do no more than a "best efforts" at marketing.

The comments of a number of witnesses or panelists are almost incomprehensible to me. They want to keep incentives to explore and drill that appear to have been proven effective by some of NGPA provisions, on the premise that gross total United States reserves on the various systems are inadequate. I've heard no concern that many operators who tried and in fact did find reserves under those same incentives now face bankruptcy because wells are shut in or restricted both on rate and price to the extent that the operator simply cannot hang on any longer. I am not referring to my own company situation but to the problem facing a sizable number of independent companies. The pipelines and distributors who are asking for drilling to resume with the market situation as it is could better spend their time asking the sun not to come up.

What I am saying is that much of the testimony I have heard makes it appear that the various segments of the industry are trying to make a case for their own corner of operations without understanding the overall interdependence of all operations.

Let me inject here one comment about one resolution which has been introduced calling for a bi-partisan national commission to draft legislation to cure the gas problem in the style of the Social Security bi-partisan plan. This is doubly faulted in that it implies a government fix instead of a market fix and if patterned after the Social Security measure would be nothing more than a band-aid for a bleeding sore.

Three alternatives are apparent: (1) maintain the status quo, (2) deregulate or (3) continue with old plus new regulation. In my opinion, the latter will result in cyclic repeated crises due to inability of government to react or reacting in the wrong direction because of pressures from the loudest crying pressure group. It would appear that some relief from the inequities that have developed is a must, so the first cited alternative is inappropriate. In my opinion, some form of deregulation offers the greatest hope for a more workable future.

The measures that have been offered to date do not address the problem of high priced imports. Some of these contractual schemes developed at a time when the domestic drilling for gas had been inhibited by low prices. With proper incentives, one of which is a climate in which the producer can reasonably extrapolate the economics of his drilling venture, I believe that adequate supplies of gas can be found at reasonable cost until such time as breakthroughs in developing renewable supplies will displace gas drilling on an economic basis. This also will be without dependence on foreign sources except those also available at reasonable cost.

On the administrations bill, I raise questions or comment on the following:

1. I doubt the wisdom of what has been implied as contract abrogation clauses that would seem to make a gas sales contract little more than a 30-day sale arrangement—if I don't like this or that I terminate. This is not conducive to stability for either buyer or seller. On the other hand in recent months some contracts have become decidedly one-sided as to these provisions, and there should be protection for both parties—buyer or seller.

2. On new and expired gas supply contracts the parties should be free to negotiate price independent of price controls.

3. The 1978 Fuel Use act provisions on market restrictions should be repealed and left to the market place.

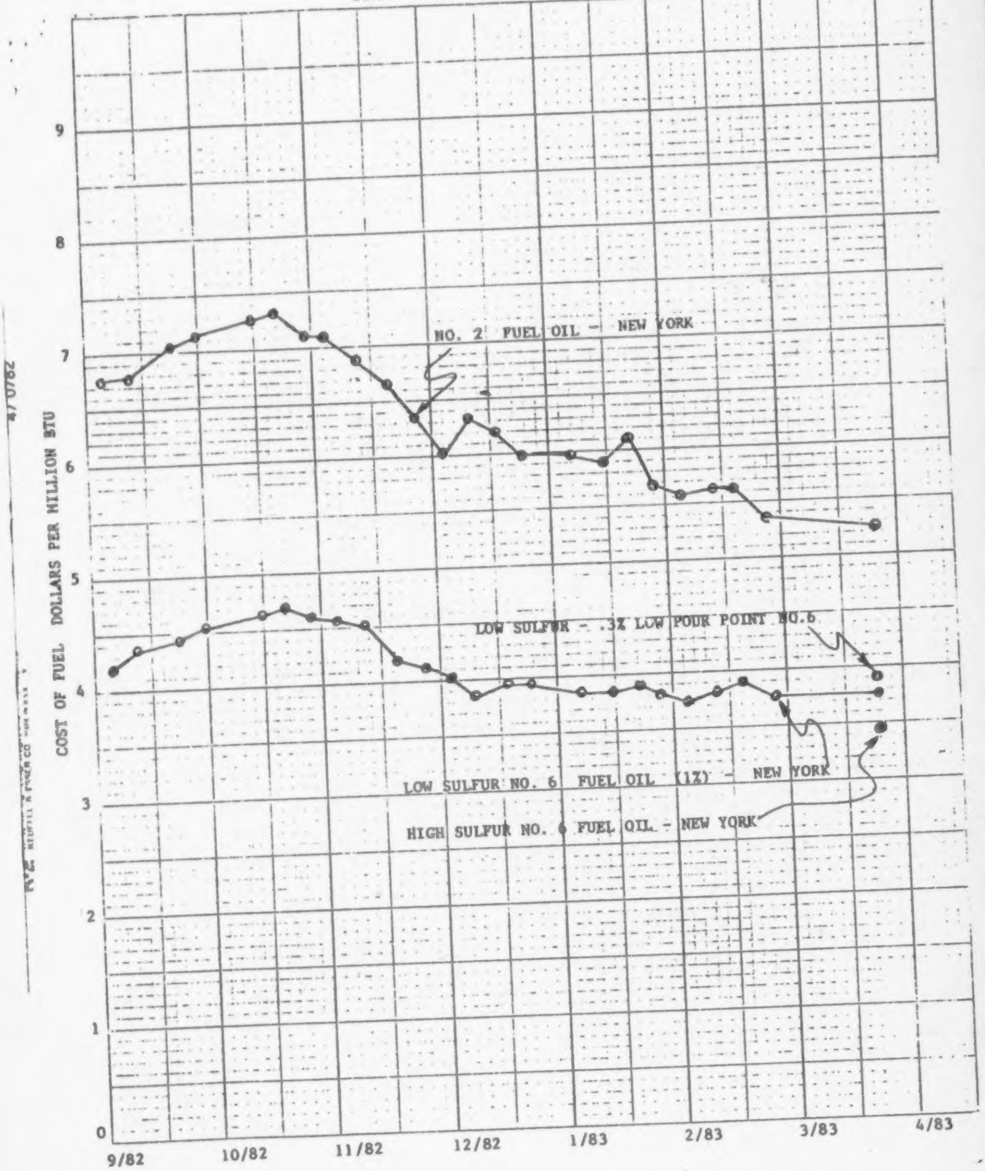
4. The provisions for pipeline transportation of end user supplies may have some application, but this should be studied carefully as to the implementation so as not to create another bog of unworkable regulation. This is voluntarily being tried in some cases.

With the current oversupply with respect to deliverability there should be minimal dislocation of prices under deregulation. It should be obvious, however, that with something like 15 percent to 18 percent annual natural depletion of reserves by production and with drilling essentially at a stand still, the supply situation will not be long in being corrected. Repeal of the Fuel Use law will also speed up some return to more normal demand for gas. With the pressure from alternative fuels being such as it is at present, now seems to be the most opportune time to deregulate with the possible end result of little change in delivered cost or even with a slight reduction in cost because of such market factors.

Let me urge you to see that the recontrol—extended control measures being considered in the House of Representatives be blocked. To me the NGPA "status quo" would be preferable to any of the proposals I've seen from the House and a few in the Senate other than the Administration Bill.

As a last remark, let me urge you to do what you can to reduce or preferably eliminate subsidized energy supplies that cannot compete in the market place. This should be true of domestic as well as foreign origin. When conditions are right economically, these presently subsidized sources can stand on their own merits. To do otherwise penalizes all of us.

COMPARATIVE FUEL COST



Senator NICKLES. OK. I appreciate your comments. Mr. Cordell, welcome, and do you have some comments you'd like to make?

STATEMENT OF DAVE CORDELL, ON BEHALF OF MUSTANG FUEL CORP.

Mr. CORDELL. Yes; I do. I apologize for being late. I understood we were supposed to begin at 1:30. That was the cause of the delay.

I am here on behalf of Mustang Fuel Corp., and we have previously provided to your staff a number of copies of our formal statement on this matter.

Senator NICKLES. Thank you. It will be entered into the record. If you wish to summarize it.

Mr. CORDELL. Yes; that is basically what I am proposing to do. I might give you a little background to this statement, and that is, when the committee of our people, of our corporation, first began discussing the Reagan proposal and trying to address it point by point and trying to assess the political aspects of it, we had quite a problem. Once we talked about it more and crystallized our thinking along philosophical lines, it became very easy, and this basically is what is represented by what I am about to report to you now.

Our statement today is intended to offer support for the proposition that the best solution to the many problems now facing the natural gas industry and consumers of gas is the return to unregulated free market forces.

It is agreed by almost all who study the situation that regulation of the industry and of gas pricing is the cause of the problems which resulted in the introduction of Senate bill 615 and other bills in the U.S. Congress. Gas is in an oversupply due mainly to large industrial users being forced by the Fuel Use Act to convert to other fuels and by other fuels being available at lower cost. This, of course, results in the domestic customers having to pay an ever increasing share of higher priced gas, which is really what has prompted this hearing.

The unfortunate decision to apply the Natural Gas Act to wellhead pricing led to shortages which in turn led to an unbalancing of interstate versus intrastate markets, which in turn led to another overreaction in the form of the Natural Gas Policy Act of 1978.

Now it is proposed to set all this straight by further tinkering with the supply and demand situation by new forms of regulation and abrogation of contracts. We believe this is wrong and will not solve the dilemma.

Although it will take time to sort itself out, permitting free market forces to work so as to allow nonpolluting natural gas to compete as a fuel on a commodity basis with other fuels is the answer.

Mustang Fuel Corp. opposes the Natural Gas Consumer Regulatory Reform Amendments of 1983 as dangerous, precedent-setting interference with the free market system. The present chaos, inefficiency and high prices in the gas market are the direct result of past government actions based on invalid assumptions and miscalculations of market trends. The Reagan administration proposals repeat these past mistakes and for the most part are complicated and offer no improvements over present regulations.

Rather than decontrolling prices, various proposals actually extend price controls on some categories of gas now set to be deregulated in 1985.

Decontrol now, with declining crude oil prices and natural gas oversupply, presents the opportunity to correct past mistakes from governmental meddling in the free market and would result in lower gas prices for the Nation. With a return to free market forces and reliance on the laws of supply and demand, the petroleum industry will be able to provide a stable, long-term supply of natural gas at reasonable prices.

Accordingly, Mustang urges immediate decontrol, total—excuse me, let me start over. Accordingly, Mustang urges immediate total deregulation of all gas pricing, repeal of the Fuel Use Act, a lifting of all restrictions on the transportation of gas pursuant to the Natural Gas Policy Act and denial of any attempt to allow congressionally permitted abroation of contracts. Thank you.

[The prepared statement of Mr. Cordell follows:]

MUSTANG FUEL CORPORATION

STATEMENT OF POSITION ON NATURAL GAS DEREGULATION

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MUSTANG FUEL CORPORATION

STATEMENT OF POSITION ON NATURAL GAS DEREGULATION

BRIEF HISTORY OF NATURAL GAS REGULATION

Interstate natural gas transportation has been regulated by the federal government since 1938 and wellhead gas prices have been controlled since 1954. With the deregulation of crude oil by the Reagan administration in 1981, natural gas is the only energy source still subject to price controls.

Over the years, regulation held gas prices artificially low, thus reducing incentive to search for new supplies. This situation created severe gas shortages in the bitter winter of 1976-77 and led to new regulations intended to "solve" the problem.

This bureaucratic solution, the Natural Gas Policy Act of 1978, contained immensely complicated controls and policies with over 25 different prices on different categories of gas. Rather than easing the nation's natural gas dilemma, the NGPA compounded it and resulted in consumer price increases more rapid than would have occurred with no regulation at all.

One goal of the NGPA in 1978 was to allow prices for certain categories of gas to rise over a period of time and reach parity with the world price of oil, thus stimulating gas exploration. The regulators projected that oil prices would average $15 per barrel in 1985, but prices have since climbed to twice that amount or more.

The NGPA did result in increased gas exploration, but the accompanying higher prices it authorized sent consumers scrambling to find cheaper fuels.

Further aggravating this situation was the NGPA's companion legislation, the Powerplant and Industrial Fuel Use Act of 1978. The Fuel Use Act placed restrictions on the use of gas by industrial and utility customers and forced them to undergo costly equipment changes so that they could convert to fuel oil and coal.

A portion of the Fuel Use Act which would have prohibited any use of gas by industries or utilities after 1990 was repealed in 1981, but these customers have not resumed using gas as expected because of its current price and the clouded regulatory picture.

The switch away from gas by the industrial sector has lowered overall demand, created a national "surplus" of gas and left the burden of higher prices mainly with residential customers.

WHAT GAS DEREGULATION OPPONENTS ARE SAYING

Opponents of natural gas deregulation claim that a free market pricing approach will allow gas prices to skyrocket and allow gas producers to reap huge profits from a rapidly depleting resource.

The same arguments were heard from critics before crude oil was deregulated two years ago, but events since then have proven these claims to be unfounded.

Exploration for crude oil has increased in the U.S. since 1981, halting a steady decline in production which occurred during the 1970s. With oil production holding steady, consumption declining and prices going down, the U.S. has been able to increase energy security by reducing its dependency on costly imported oil by 27 percent.

Gasoline prices also reflect the impact of oil decontrol. Initially, gasoline prices rose 7 to 8 cents a gallon after controls were lifted (and after a wave of world oil price increases), and some critics predicted that the price would go to $2 a gallon by 1982. Instead, gasoline prices have leveled-off and actually fallen to $1 a gallon or less in many parts of the country.

The economic principles of oil and gas are the same -- a free market allowed to respond to supply and demand will allocate resources more efficiently than government controls.

NO NEW TAXES NEEDED

Some members of Congress have indicated that lawmakers are not likely to agree to natural gas deregulation without attaching a so-called "windfall profits tax." They claim that this would prevent gas producers from "getting rich" at the expense of rate-paying consumers.

Mustang Fuel Corporation is opposed to any such tax and believes that the very people these congressmen claim to be protecting -- American gas consumers -- would actually be the ones paying the tax in the form of higher utility bills.

The "windfall profits tax" which accompanied crude oil decontrol -- in addition to costing producers, and ultimately consumers, billions of dollars -- is so complex that it is very difficult even for experts to comprehend. There are also serious legal considerations of the tax, evidenced by a recent decision by a Wyoming federal district court that it violates the U.S. Constitution. The Supreme Court is expected to rule on an appeal in the case later this year and if the lower court's decision is upheld, refunds of billions of dollars will be due -- thus stifling attempts to balance the federal budget.

A tax on natural gas would offset most of the benefits of decontrol by discouraging exploration for new gas supplies. It would also add uncertainty to an already confused market situation.

ANALYSIS OF THE "NATURAL GAS CONSUMER REGULATORY AMENDMENTS OF 1983"

Outlined here are major provisions of the Reagan administration's proposed bill to phase out control of natural gas prices, followed by Mustang Fuel Corporation's position on each point.

CONTRACTS

1) Allows new gas contracts, and existing contracts renegotiated after enactment, to operate by their terms.

2) Allows pipelines to reduce their "take-or-pay" obligations to 70 percent of deliverability.

3) If take-or-pay option is exercised, seller can resell elsewhere the amount of gas reduced, but the pipeline (buyer) must transport the gas at an incentive rate.

4) Limits escalator clauses in all contracts signed prior to enactment to the gas "cap" (the average price of gas under new or renegotiated contracts) through 1/1/86.

5) On 1/1/85, for any contract that has not been renegotiated, either party may exercise a "market out" (abrogate the contract). If contracts are terminated, the purchaser (pipeline) would be required to carry gas for the seller to any other purchaser at an incentive rate.

Mustang agrees with point (1) as it returns free market principles to natural gas markets.

Mustang vigorously opposes the remaining four points which represent government "tampering" with contracts -- an ominous legal precedent striking at the heart of free market principles.

Long-term contracts are a vital part of oil and gas operations because of the long-term nature of capital investment the business requires. If this federal revision of gas purchase contracts is permitted, it forever opens the door for government revision of other contracts.

The right of parties to enter into lawful commercial contracts without government interference is the cornerstone of the free market system and undoubtedly would be defended in long court battles should these provisions become law.

In addition to the obvious legal questions, Mustang feels that point (3), relating to the gas freed from take-or-pay contracts in point (2), is illogical and does not reflect market realities.

If a pipeline needs to reduce the amount of gas it is taking from a producer due to market conditions, the producer faces the same market conditions and most likely would be unable to find another buyer. Thus, the requirement that pipelines transport the contract-freed producer's gas at an incentive rate is totally unrealistic.

PRICING

6) Effective on enactment, all gas under new or renegotiated contracts (except Section 107-deep or tight sands gas) is deregulated.

7) All gas is decontrolled from the non-price regulations of the Natural Gas Act (NGA) and the Natural Gas Policy Act (NGPA) on 1/1/85, or on renegotiation, if sooner.

8) The authority of Congress or the president to reimpose controls is repealed.

9) Pending renegotiation, prices for all gas (except Section 107-deep or tight sands gas) are the lower of the NGPA price ceiling or the gas "cap."

10) The price of Section 107 (deep or tight sands) gas would be held at the maximum allowable price in effect at the date of enactment until the gas "cap" rises above that price.

11) Through 1/1/86, pipelines would be required to obtain approval from the Federal Energy Regulatory Commission (FERC) in order to pass-through any gas costs above its last pre-enactment level plus inflation.

Mustang agrees with the free market approach reflected in points (6), (7) and (8).

Mustang opposes point (9) because it continues regulation of gas prices, only on a different basis than before, and point (10) because it places new price regulations on gas which was deregulated under previous legislation.

Mustang also opposes point (11), which is recognized as a politically motivated answer to high consumer gas prices. If an interstate pipeline -- or any other business -- is not allowed to pass-through its actual costs, it will eventually go out of business.

OTHER PROVISIONS

12) Repeals parts of the Industrial Fuel Use Act (forbidding some uses of natural gas) and incremental pricing.

13) Prohibits pipelines from taking gas from its own production at rates higher than the rate of take for less expensive gas.

14) Gives all buyers (pipelines) equal access to offshore and interstate gas.

Mustang agrees with the free market approach reflected in points (12), (13) and (14).

In addition, Mustang supports repeal of the Fuel Use Act, point (12), regardless of other decontrol considerations. Repeal is in the best interests of American consumers. It will allow the laws of supply and demand to decide which fuels are most suitable for industrial use in producing products at the lowest cost possible.

CONCLUSION

Mustang Fuel Corporation opposes the Natural Gas Consumer Regulatory Reform Amendments of 1983 as dangerous precedent-setting interference with the free market system. The present chaos, inefficiency and high prices in the gas market are the direct result of past government actions based on invalid assumptions and miscalculations of market trends. The Reagan administration proposals repeat these past mistakes and, for the most part, are complicated and offer no improvements over present regulations. Rather than decontroling prices, various proposals actually extend price controls on some categories of gas now set to be deregulated in 1985.

Decontrol now, with declining crude oil prices and natural gas oversupply, presents the opportunity to correct past mistakes from governmental meddling in the free market and would result in lower gas prices for the nation. With a return to free market forces, and reliance on the laws of supply and demand, the petroleum industry will be able to provide a stable, long-term supply of natural gas at reasonable prices.

# # #

Senator NICKELS. Thank you very much for your comments and for the panel and also for your indulgence in competing with the fashion show. Our crowd has probably moved over there. They heard the music. Nothing wrong with that. I've been in a lot of hearings the last 2½ years. This is the first time we've had some background music to liven it up.

A couple of comments. All of you I think have mentioned total deregulation of natural gas except for Mr. Knight and, Mr. Knight, you were saying that we should keep controls on all gas; is that——

Mr. KNIGHT. I meant to imply that you should let the contracts do their own——

Senator NICKLES. No abrogation of contracts.

Mr. KNIGHT. No abrogation of contracts, but when they come up for expiration or by mutual renegotiation between the parties. Let them do that.

Senator NICKELS. Was there a consensus—excuse me for—maybe I was listening to the music. I was thinking somebody on the panel had said that. Do all of you agree that we should deregulate all gas?

Mr. MCDOWELL. Yes.

Mr. LAMB. Yes.

Mr. KNIGHT. But not abrogate contracts.

Senator NICKLES. All right. Under present NGPA, and I guess this would be the way to answer it, under present NGPA, old gas would remain perpetually under controls on January 1, 1985.

Mr. KNIGHT. May I enlarge on what I am talking about there?

Senator NICKLES. Certainly.

Mr. KNIGHT. I worked for Crystal Oil down at Shreveport for several years. We had some contracts with Arkla. Now, Arkla's tough, but at least they—if you get them backed in the right corner, they're fair about making changes. If you had deregulated the price, get them to give us—and in some cases we were boxed in by that, we had an additional surprise that we could use as a lever to upgrade old contracts, and we did some of that. That's the kind of thing that I think has worked in the market and I think it's an acceptable thing.

It will not have a tremendous impact on the pricing at the consumer level because there's not enough of it. The independent generally lacks large blocks of reserves to be used for bargaining. The majors have it. I worked for a major for 24 years. I know how they go about their business, too.

Senator NICKLES. So you're opposed—you do favor deregulation of——

Mr. KNIGHT. All gas.

Senator NICKLES.— of all gas. Given the present administration proposal, in the first place, I think it needs to be stated, it doesn't automatically say that by January 1, 1985, all contracts would be abrogated, but it does give a one-party opt-out by January 1, 1985, a window of a period of a year.

Mr. KNIGHT. I think that's dangerous.

Senator NICKLES. I would agree with you. I think there's some real negatives in it as far as contract negotiations, et cetera. If that was still in the proposal and, Mr. Cordell, your statement I think was right on target. If you and I were drafting the bill, we would draft the bill very much in that vein. We may not have the votes for that bill. So if we are faced with the situation with the present bill, which accomplishes the goals I think that were addressed by everybody, eventually natural gas deregulation by January 1, 1986, but with the negatives of a one-party opt-out, also with negatives of gas caps, which could be price rollbacks for producers, passthrough limitations, et cetera, are the negatives too great a price to pay for total deregulation by January 1, 1986?

Mr. KNIGHT. Let me respond for a moment. I think you can deregulate right now and you wouldn't see anything, if anything, but a decrease in price. You can sell something that is above market, and I think the fuel oil situation has got the gas industry backed into a corner right now. I've even had some of the segments of the coal industry thrown in my face.

I was trying to get an addition to a contract recently and I was told by the buyer that he couldn't afford to pay me more than $2.40 for the gas as a policy matter of his company because—and I don't know how he figures his economics on coal operation. I know that in another instance here in Oklahoma, one operator tells me that his laid-in coal cost per million Btu is $1.60. That's not the end of it, though. You've got maintenance problems. You've got all kinds of problems. He says he thinks they may be able to pay up to $6 for gas and still be competitive with the coal.

Senator NICKLES. Is this utility or industrial?

Mr. KNIGHT. Utility. Although the Btu value is much less than what we're getting for gas. But you do have these alternatives that are going to hold prices down. I don't think you would see an increase in price if you deregulated the whole thing right now.

Senator NICKLES. I would concur with that and I think that's kind of what Mr. Cordell and others have said, that it would be much preferable for an immediate decontrol and allow contract sanctity to where the contracts could actually provide for a stabilization of prices over a period of time anyway. I would concur with that if that—and maybe that would be something we will push for.

Many have indicated that we don't stand a whole lot of chance to pass that type of more immediate decontrol, maintaining contract sanctity, et cetera. If that is the case and we're wrestling with the decision of the current inequities which many of you pointed out—again, if we're wrestling with the NGPA, are these negatives, the continuance of controls between now and January 1, 1986, are they too great of a price to pay for eventual total decontrol by January 1, 1986?

Mr. LAMB. I was going to respond. I think that, of course, the nature of my prepared comments was that we have weighed those negatives and we feel that although they're significant, that we're willing to accept those negatives to obtain full decontrol by January 1, 1986.

Senator NICKLES. Mr. Cordell.

Mr. CORDELL. By saying full decontrol, do you mean without any strings attached, unconditionally, no abrogation of contracts and so on, yes, I think we'd agree with that, but if the rest of the proposals are tied to that——

Senator NICKELS. If you had the one-party option out, market out by January 1, 1985——

Mr. CORDELL. I think we would prefer to live under the system as it now exists.

Senator **Nickles**. Could you give us just a little bit of background, too, with Mustang Fuel? You're substantially in new gas and in old gas; is that correct? I won't say deep gas.

Mr. **Cordell**. We're not in deep gas, if you will. The majority of our gas supplies are not old gas. We're looking at it both from the producer's viewpoint and also from the transporter's viewpoint.

Of course, the administration has held out a little indicator for all the segments. The transporter is given an incentive fee to transport the supplies of gas that are left over when the purchaser exercises his reduction down to 70 percent, which is meaningless, because if he doesn't want it, nobody else does.

But as I say, there's a—it's obviously an artfully drafted bill from a political standpoint and that, of course, is what you're having to deal with, I understand, but I do believe that the better solution would be to just let the Natural Gas Policy Act expire by its own terms and live with the situation as it is now rather than add these additional layers of regulations and proposals to strike at the very heart of our system of being able to get out from the contract-----

[Interruption.]

Senator **Nickles**. Go ahead.

Mr. **McDowell**. Given the option between those two, of course, as I mentioned before, most of Hadson's gas is 102, 103, or 107. Our obvious choice would be, boy, let's get them, let them old guys worry about it. I think that as a practical matter, in the best interests of the Nation, if given the choice between the President's proposal and the continuation of the NGPA, I would have to say the President's proposal is a lot better, even though obviously it's going to be less for Hadson because, you know, if you put it in there with some sort of a gas cap, we are going to suffer an immediate price reduction, we feel, in all of our 102 and 103 gas.

I've heard the term price freeze put on the section 102 gas. That's a price cap. I don't believe that if I am getting $9 a thousand cubic foot for mine right now that that's going to guarantee I am going to get $9 forever on that thing. It's going to say that I can't ever get more than $9 and that as the time comes up for any kind of renegotiation, that price is going to go down immediately. But we just can't price ourselves completely out of the market. We recognize that and we feel that we would be willing to work within a free market system, and we'd do almost anything that we can do to get to a free market system. Basically, I would reiterate that the foundation, the very foundation of a free market system is contracts entered into between private parties without outside interference.

Senator **Nickles**. Do you have a bunch of old gas contracts or would you speak just as strongly against the one-party out?

Mr. **McDowell**. Yes, if I had a whole bunch of old gas contracts—I've got two or three and I can visualize coming January 1, 1985, and I go to my gas purchaser and say, boy, I want out of that old gas contract, and under an old gas contract, it's probably got a deplete—it's a depleted well that's, oh, maybe got one-half billion cubic feet of gas left in it or one-quarter million or something like that, and he says fine, boy, we have to comply with the law, and we'll let you out of that contract, and he says, now what are you going to do with it. Well, I am going to try to find somebody to buy it. He says have at it. And I go out and I try to find somebody to buy this little bitty gas that somebody's hooked up to, and somebody's going to come up and say, OK, instead of 75 cents a thousand cubic foot, I am going to give you a dollar and a quarter, and you're going to have to pay a dollar and a nickel transportation fee, and I say, boy, I have made a heck of a deal there. So, no, I really don't believe that there—the upward renegotiation of old gas contracts is going to be materially significant.

Senator NICKLES. Do you think by deregulation of old gas we would enhance our finds or production in the long term on old gas?

Mr. McDOWELL. Well, other than the fact that you will strengthen a portion of the gas industry that has a lot of old gas, and by keeping them strong, you'll keep the dollars in there to reinvest in new exploration and find that, yes, you will.

Senator NICKELS. By deregulation of old gas, would the marketplace be trying to explore and develop those resources on a higher priority basis than you would on your higher cost production areas?

Mr. McDOWELL. Oh, very definitely. You could take a production map of Oklahoma—for example, the Anadarko Basin. If you're familiar with it, it just gets deeper as it goes west. You can plot the exploration as it moves westward to deeper, deeper horizons with the increase in gas prices.

In 1968, 1969, for example, gas prices were 17 to 19 cents. That's what they were—they were regulated under the Natural Gas Act. The Oklahoma intrastate markets were usually a penny above that market demand. That's what they had to pay in order to get some supplied. People could drill to about, oh, 7,000 feet at that particular time to get gas. Prices went up to about 22 cents. They moved down to about 10,000 feet. Prices moved up—Oklahoma intrastate markets finally started really competing in 1972, 1973, 1974. The prices went from, oh, 20 cents to 45 cents to 75 cents, $1.10, $1.40, $1.70, and they were at about $1.75 when the NGPA was passed in 1978, and you can plot just real easily that with each price increase, they moved another 2,000 feet out into the basin. With deregulated 107 prices and the people saying, hey, we will pay you what the No. 2 fuel oil is or 110 percent of the No. 2 fuel oil because that's what we can get out of our markets. We'll pay you that.

You should have seen the boom down in the Comanche County, 100 rigs all going to 22,000 feet, average cost of a well $15 million apiece. You know, as far as we are concerned, the supply and demand worked real great. You supply us the price, boy, we'll go out and risk everything we have trying to develop a lot of——

Senator NICKLES. Did the market dictate that $9 or was it the fact that you had some old gas that was subsidizing those——

Mr. McDOWELL. Very definitely some old gas was subsidizing it or they would never have been able to go above the price of the No. 2 fuel, which is one of their alternate competitors, but they did have it and they said we have been told by every public service commission in the northeast that we will not tolerate anymore schools being closed in the wintertime because you don't have supply of the gas. This is what happened in 1976. So these pipeline companies say, boy, we don't want those headlines anymore, so we are going to insure supplies.

Senator NICKLES. If the decontrol of oil would enhance the production of the more shallow wells, the cheaper to produce wells, wouldn't that be of economic benefit in the long run for consumers?

Mr. McDOWELL. Probably would, yes, sir.

Senator **Nickles**. OK. Does anybody have any additional comments on that line of thought or on the thought of if the final proposal had abrogation of contracts—I read from different production groups that we've had both in Washington and in Oklahoma two major concerns. First I would say would be abrogation of contract. Second I would say would be where is the gas cap coming in which, in effect, is to abrogate the contract. If you have a contract that says you're going to receive $3.30 and the gas cap comes in at $2.70, you're abrogating the contract, but they're unrelated. But one is through the definition of gas cap and one is through the one-party market out.

Do you have any further comment that you might say those are too great a price to pay for even deregulation of old gas even though most everybody recognizes there are economic benefits for consumers and industry, et cetera, if we would move in that direction? Is contract abrogation too great a price to pay?

Mr. **Lamb**. I just wanted to add one or two more comments in regard to the old gas. First thing, I think it's a little bit like—you take a pay. You think it's blown out of proportion a little bit. I have seen some recent numbers that would indicate the 16 largest oil companies, the deregulation of the old gas would increase their revenues approximately 4 percent. Well, that's a lot of money when you get it down into dollars, but I think Secretary Hodel has done a very good job here in trying to come up with something that doesn't benefit or hurt somebody more than that amount.

I did want to mention also that our contracts, of course, have been abrogated since 1954, and under some of our old contracts like we have right here in the Anadarko Basin, they're being abrogated right now when we're held at the present regulated price.

It's the Commission's interpretation of the contract term that it's a life lease contract that prevents us from getting the contract prices provided for in those contracts. So we feel like—in fact, those contracts—some of those contracts if they were just taken out from under the Commission would be entitled to higher prices. So they're being abrogated currently.

Senator **Nickles**. But by the Corporation Commission or by the Federal Government?

Mr. **Lamb**. The MPC and now the MPRC.

Senator **Nickles**. Could you explain that a little?

Mr. **Lamb**. Yes; we have contracts out there that have primary term like for 20 terms; then it was year to year thereafter.

Now, the contract had a gas price in it. When we got up into the primary term, we were supposed to get a price redetermination, but the Commission has determined that contract, as a life for lease contract, and under a life for lease contract, we're limited to pre-1973 price. So that's what we get. We've gone through the primary term and we're entitled to a price redetermination. The regulations say we can't do it.

Senator **Nickles**. The price redetermination would be negotiated between you and the pipeline?

Mr. **Lamb**. And the purchaser, yes.

Senator **Nickles**. But yet the Corporation Commission——

Mr. **Lamb**. No, the Federal Power Commission.

Senator **Nickles**. Federal Power Commission or FERC says no, it's for the life of the lease. So even though you finish the life of the original contract for the 20 years and you have the redetermination clause already in your contract, they would forbid you to redetermine the price and would keep you on the older fixed price?

Mr. LAMB. You've got to qualify for a rollover and under a rollover, you can get about a 70- or 80-percent increase in the price, but we don't qualify for a rollover.

Senator NICKLES. Mr. Knight.

Mr. KNIGHT. That's the kind of deregulation I think you ought to be looking at. When you define deregulation of old supplies. I think it needs to be carefully defined where everybody understands what you're talking about. He's going to live with that contract out to the end of the term of it, but then—so he gets to the end. He is still under Federal regulation under what he can do, and on this gas cap thing, are we deregulated or are we not? That's still a Federal ceiling that goes—that goes contrary to open negotiation.

Senator NICKLES. Under the proposal, and I'll make this little summary statement unless anybody else has anything to add, under the proposal, no, you would be under this ceiling or this cap really from this date forward and, of course, it would be a moving cap. It would be recomputed on a monthly basis after they get their 3 or 4 base months in, but you would be under that regulation really from date of enactment through January 1, 1986, and that cap or that ceiling may well be—many estimate it would be less than current NGPA prices and it says cap or NGPA, whichever's less, so yes, you would have price controls, and even on 107, which is presently deregulated, it would have a freeze. So it would have a control.

Mr. KNIGHT. Does the cap go out the window, then, in 1986?

Senator NICKLES. Yes; so here again, that's an inequity that a lot of us don't like——

Mr. KNIGHT. I think you could live with it for that period of time.

Senator NICKLES. That's the question, could you live with it.

Mr. KNIGHT. I don't think you're going to have much choice because I think these competitive fuels are going to put it down at that level.

Senator NICKLES. We've already had some expert testimony today that showed for the last couple of months the new prices that were being filed in Oklahoma under 102 and 103 were less than NGPA. What that would do in effect really, though, would come out to—your gas cap would come in less than what NGPA prices are, particularly when you roll over the renegotiated old and possibly renegotiated new, probably the cap's going to come in fairly or substantially less than 102.

So then you're going to be telling a producer, sorry, you might have been receiving $3.20 but you could be receiving $2.70 or whatever that new cap would come in, depending on how we define cap and what contracts would be applied in determining that cap, but you could be talking about a fairly significant pain or penalty or, conversely, what Secretary Hodel had said, well, that's the—there's 10 minutes to renegotiate the contract. That's the club over somebody's head, but as soon as you renegotiated the contracts, that's deregulation. If you renegotiate or negotiate a new contract, then subject to whatever terms that you would sign, which in my opinion is a good step in the right direction. It's just the pain that would be involved between now and the limitations that we see, including contract abrogation and gas cap limitations and passthrough limitations that would be involved in that interim period, and that's what we're wrestling with.

Now, it would be that we could work and come up with some other type to where we would still have as our goal either January 1, 1985, which I prefer, or January 1, 1986, as a date of, OK, everything's deregulated at that time. Is there some other mechanism—if we can't do it before then, and I would agree I would much prefer tomorrow, but if we can't do it tomorrow and political realities say 1985 or 1986, in that interim period of time, all right, there's going to be some type of controls. What can we do? How can we structure those controls to allow the market to operate with as little hindrance as possible in that interim period of time? That will be something that we'll be wrestling with, and I'm very thankful and appreciative of the input that you gentlemen have given us as well as the rest of our panelists. I think we've had some outstanding contributions from many people from all sectors of the industry that have given us different ideas and there have probably been as many different ideas for as many persons and panelists that we've had, but I think that has been very helpful to me and I think it will be helpful to the committee.

There is a signup sheet on the back table if you'd be interested in receiving a copy of the printed record of this hearing. That will be available probably in 6 to 8 weeks.

If you'd like to have a copy of the transcript sooner, speak with our reporter who has been so faithful in working so diligently with us today.

Again, I would say thank you for your input. If you have some additional comments or revisions that you would like for us to make a part of the record, if you would submit those to us soon, and I would like to ask—it may be that myself or other members of the committee may have some questions that we wish to submit to you, and we appreciate your early response to kind of maybe complete some of the areas of the record that I didn't touch on today. So if you would respond to those in a timely manner, we would be most appreciative.

So with that, we will adjourn this committee meeting. Thank you very much.

[Whereupon, the committee adjourned.]

[An additional statement submitted for the record by Mr. Mueller follows:]

Statement by Michael J. Mueller
Assistant Professor of Economics
University of Oklahoma
March 28, 1983
Senate Energy and Natural Resources Committee
Hearing on Natural Gas Deregulation

I. Explanation and Analysis of Current Situation

Committee members, ladies and gentlemen, thank you for this opportunity to present my views on the possible effects of changes in the natural gas industry regulations and in particular the effects on the citizens and industry of Oklahoma. In my prepared statement I will first identify the various groups in Oklahoma effected by natural gas regulations. Next I will outline existing conditions which are generating dissatisfaction with the current laws and regulations governing natural gas markets. Then I will explain how groups in Oklahoma are positively or negatively affected by these conditions. After this some changes proposed by others and their effects will be noted. Finally, I will give my recommendations and explain their effects for Oklahoma.

Groups Affected by Natural Gas Regulations. The following groups comprise the natural gas market and are affected by its regulation: consumers of natural gas (residential, commercial, agricultural, small industrial, large industrial including electricity manufacturers); producers and royalty owners of natural gas wells and reserves; distribution companies; intrastate pipeline companies; interstate pipeline companies; state and local governmental units; and various combinations of these groups such as the intrastate pipeline/distribution firms and the integrated producer/electricity manufacturers. I will focus on four of these groups which are particularly significant for Oklahoma: a) consumers; b) producer/royalty owners; c) intrastate pipeline/distribution; and d) interstate pipelines.

Existing Regulations and Conditions Concerning Natural Gas. The natural gas market is regulated by three basic Federal statutes. The Natural Gas Act (1938) allows interstate rate regulation and certification of interstate pipelines, control of wellhead prices of gas produced by interstate pipeline affliates, end-use moratoriums, and curtailment schedules. The Fuel Use Act (1978) provides for a ban on gas use by large industrial users until 1990 and for off-gas provisions. The Natural Gas Policy Act (1978) mandates wellhead price regulation of all gas, incremental pricing to large industrial users, defines several categories of gas production, and sets the price for each category and the rate of deregulation of some categories of natural gas. The Oklahoma Corporation Commission provides rate regulation for intrastate pipelines and distribution companies.

As a result of these laws four important situations exist which have generated national interest in changing the way gas is regulated. 1) There have been large price increases to distribution firms and to consumers. For example, charges by interstate pipelines to Oklahoma firms have increased from 94-286% during September 1978 to September 1982 while the Consumer Price Index increased 47% during that period. 2) Demand for or use of natural gas has declined relative to expectations because of decreased use by residences (down 14% from 1978-1982) and fuel switching by large industrial uses to mention two reasons. This has caused a vanishing rate base for many pipeline and distribution companies. 3) The wellhead price for much natural gas production will not be deregulated under the NGPA. The purpose of this was to provide a price cushion to users for the gas being deregulated. It has resulted in shuting in of wells and significant inequities between pipeline companies in cost of their purchased natural gas. 4) Some categories of gas were immediately decontrolled by the NGPA. This resulted in rapid increase in price for this gas, misallocation of exploration and development efforts toward these categories, and gradual redefinition of wells into these categories. As a result of these and other conditions, the supply of natural gas available the last two heating seasons has been in excess of supplies used resulting in a fall in price of gas from uncontrolled categories this Fall. At the same time supplies available from controlled categories have not expanded and the price of alternatives (No. 2 and No. 6 Oil) have made them favorable fuels for large industrial users.

Effects of Current Regulation on Four Groups in Oklahoma. 1) Consumers of all types are negatively effected by all four situations: high prices, vanishing rate base, stagnant supply of cushioned gas, and misallocation of resources to decontolled categories. 2) Producers and royalty owners gain from higher prices but lose from decreased usage of gas, low prices for cushioned gas, and only a segment gained from market priced gas and only when that price was much higher than todays level. 3) The interstate pipeline/distributors are negatively affected by their unfavorable position relative to cushioned gas supply, their vanishing rate base, the long-term contracts with take-or-pay provisions, the incremental pricing to large industrial users, the ban on new use by large industrial users, and in general their inability to compete with interstate pipelines. 4) The interstate pipelines are in much the same position as the intrastate pipelines except for those which have a relatively large supply of natural gas which will not be deregulated in 1985.

Suggestions by Others to Deal with these Problems. Various elected and government officials and others have suggested the following, among others; a price freeze on all natural gas wellhead prices to stop rising consumer prices; deregulation of all wellhead prices with a windfall profits tax to generate new supplies; annulment of take-or-pay contract provisions to free pipelines, distributors and others from incentive to backout low cost supply in times of slack demand. The Federal Energy Regulatory Commission has taken action to limit new take-or-pay provisions to 75% of committed reserves, to redefine rate bases in favor of residential users during purchased gas adjustment hearings, and to curtail use of high price gas at the expense of low price gas by pipelines. FERC addresses some significant problems but does not get at the cause of these problems. The above proposals compound more problems than they solve. Deep and significant restructuring of the natural gas market is needed, not short run fixup.

Recommendations for Revitalizing Natural Gas Markets. 1) Deregulate all natural gas wellhead prices between now and 1985 by allowing an increasing percentage of gas delivered each month from each and every well to be sold at the "market price," as negotiated between the owners and his or her customers, so 100% of the gas sold in January 1985 will be at the "market price."

2) Complete deregulation of rate regulation of all sectors of the pipeline industry except retail sales by distribution companies. The state would continue to regulate these natural monopolies and they must be equally accessable to all suppliers of natural gas through exchanges, cross-hauling, etc.

3) Encourage development of a futures and spot market for natural gas based on certified volumes of natural gas in proved reserves and storage.

Effects of Recommendations on Four Groups in Oklahoma. Consumers might face somewhat higher prices but excess supply conditions and stagnant demand indicate prices will not increase significantly. Most likely they will reflect the value of natural gas to the marginal user--the user just on the verge of switching to an alternative fuel--and that is residual fuel oil (No. 6 Oil) in large industrial use. This effect on prices is strengthened by the distribution companies forcing all suppliers of natural gas to compete for their business. Further, state regulators will know the market value of natural gas because it will be set in the futures market. This will bring stability to rates because distribution companies can hedge a years supply in the futures market. The two or three year monthly phase out of controlled prices will allow a reasonable adjustment period for consumers, producers, and pipelines. The expected changes will be naturally reflected in the futures market. Producers and royalty owners may find the price of some categories of natural gas increasing and certainly only falling for a small portion of all natural gas marketed in Oklahoma. Exploration and production efforts will be directed where the technologically most favorable prospects are not by artificially mandated categories. The "deep gas" segment may decline but it already has and without an increase in another segment. The intrastate pipeline/distribution firms will face the most radical change. They will be forced to separate legally from the regulated distribution sector and compete with each other for gas supplies and gas customers. The interconnected web of piplines plus exchanges and cross-hauling makes this physically possible and practicle--no longer can they be considered natural monopolies. They can compete for gas and customers with interstate pipelines. The vanishing rate base will no longer exist and contracts will be renegotiated when business conditions change as is done in most other industries. Some pipeline companies may fail if there now exists overcapacity in the industry. Eventually, the pipelines may move toward contract transportation for purchasers of natural gas rather than purchasing it themselves. Much the same is true of the interstate pipeline companies. A futures market will help producers, distribution companies, state and local governmental units, and large industrial consumers plan their activities without being tied to inflexible long-term contracts. It will allow clear development of relative fuel values by arbitrage across the existing oil products futures market, the forthcoming crude oil futures markets, and the existing international fuel futures markets. The stability encouraged in production, exploration, and revenue should start to trend toward predictability in proceeds from the gross production tax--a positive benefit for state government.

II. Specific Recommendations

1. Repeal of the Fuel Use Act (1978). This act places restrictions on the use of natural gas to various categories of industrial users. Industrial users should be able to secure the lowest-priced and most suitable fuel for their applications, be it natural gas or another fuel, so their products can be manufactured at the lowest cost possible. Repeal of the Fuel Use Act will have significant rate reducing effects on electricity and will increase the market for natural gas.

2. Repeal of the Natural Gas Policy Act (1978). Price controls and other provisions of the act applying to all categories of natural gas except old interstate gas (section 104) should be removed completely by January 1, 1984 and old interstate gas should be deregulated completely by July 1, 1984. This phased decontrol of prices and market constraints will eliminate many of the inequities in costs, prices, and supply of natural gas now existing as well as eliminate misallocation of capital and other productive resources within the natural gas industry and between natural gas and other industries. Little or no price increase will result because of the excess supply of gas available for the next few years.

3. Voluntary Renegotiation of Natural Gas Contracts. While some are advocating a mandatory market-out provision to offset such contract provisions as escalator and take-or pay clauses, it is clear that with repeal of the NGPA parties to contracts will have all the needed incentive to appropriately renegotiate these provisions as market conditions dictate. Many producers and consumers in Oklahoma believe legislated abrogation of contracts is unfair and have indicated willingness to voluntarily renegotiate.

4. Deregulate Natural Gas Pipelines. The rate regulation of interstate and intrastate pipelines is no longer necessary because the interconnected web of pipelines now in existence provides consumers access to practically all production areas and provides pipelines access to all consumers (both individual and retail distribution companies). Deregulation would free producers, consumers and pipelines to seek the best arrangements possible given their location and requirements: this would allow fertilizer manufacturers and others to buy directly from the wellhead. Deregulation coupled with repeal of the NGPA and FUA would provide a fully free market for all portions of the natural gas industry. State regulatory agencies would continue to enforce basic state laws designed to protect producers and consumers from fraud and abuse, enforce safety requirements for public protection and regulate retail distribution companies.

5. Encourage the Establishment of Organized Futures Markets for Natural Gas. With decontrol of all natural gas, repeal of restrictions on uses of natural gas, and deregulation of pipelines, natural gas takes on all the attributes of a commodity, (e.g. grain, metals, heating oil, crude oil) and futures markets will naturally come into being as they have for other commodities. A futures market will allow major consumers and retail distribution companies to hedge their position on natural gas supply and to plan their activities without worrying about unexpected and unpredictable cost changes. Further, futures markets will provide others public knowledge of the value of natural gas, information necessary for a free market to function efficiently.

6. No Windfall Profits Tax or Other Special Excise Tax on Natural Gas. Any tax levied on an individual market causes misallocation of capital and other resources away from that market. The resulting lack of incentive to explore and develop gas deposits will cause reduction in the rate of finding new reserves and will ultimately reduce supplies. The consumer will ultimately bear the burden of the tax plus the eventual higher prices of supplier contracts in the future.

7. Imported Natural Gas Restrictions. Imports of natural gas should be limited to gas available at a price equivalent to market prices in the United States. This will take place automatically in a decontrolled, deregulated market. However, the federal government should use its influence to lubricate renegotiation of existing arrangement between importers and foreign parties.

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Natural Gas Legislation

Hearings before the Senate Committee on Energy and Natural Resources on March 28 and 29, 1983 re Natural Gas Legislation are correctly designated S. Hrg. 98–85. However, that designation should include "Part 2."

S311-41